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January 1992



GIGANTIC ISSUE!

47380

Radio Control

CAR ACTION

**chumacher
NITRO
10**

READER'S RIDE OF THE YEAR

**NITRO
BLITZ
1/8-
Scale
World
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**HOW TO:
Adjust
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**Winter
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Radio Control CAR ACTION

VOLUME 7, NUMBER 1

JANUARY 1992

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ON THE COVER: upper left—Schumacher's Nitro 10. (Photo by John Huber.) Center—Ewald Schuster's bitchin' Batmobile. (Photo by Yamil Sued.) Lower right—Time Warp: Tamiya's Sand Scorchers. (Photo by Steve Pond.)

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EDITORIAL

by STEVE POND



WE RECEIVE many requests for race coverage. Big and small, near and far, racers and race promoters want to see their races written about in *Car Action*. I confess that, early in my racing endeavors and as an author for the magazine, it was a thrill to see my name or my picture in print. As the editor of the magazine, however, I'm also committed to providing the most up-to-date information on products, tuning tips and other related topics. The trouble is that the numerous national, world-class and large non-title races, which are often the best sources of information on these topics, already have us running to all parts of the globe as it is.

I've also received requests that we print the names of all the winners at the events we cover. Again, I must decide between the interests of an individual racer and the whole R/C market. The information available from the *top drivers* at big events will always win out over lists of the racers who attended.

There's more to R/C racing than getting your name in print. You constantly test and improve your motor skills, e.g., hand/eye coordination; you learn to make proper judgments under pressure; you test the laws of physics and geometry; you make friends; and, I hope, you experience the thrill of victory, etc. If you became involved in R/C just to see your name in print, you're in it for the wrong reasons. Just kick back and enjoy it. With the help of the useful information we pass on to you, perhaps you'll see your name in the top 10 of the Nationals someday! ■

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LETTERS

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Letters," Radio Control Car Action, 251 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and brevity, and each must include a full name and address or telephone number so that the identity of the sender can be verified. We regret that, owing to the tremendous numbers of letters we receive, we can't respond to every one.

COULD IT BE...SATAN?!!

I have an Ultima that's giving me all sorts of problems. I think the mechanical speed controller is possessed by a demon. Every time I give it full throttle, it sticks, and this results in another crash into a wall. I was thinking of buying a Novak 610-RV to get out of sticky jams or a 410-M1c for extended run times. Which do you recommend? I'd also like to buy a race

truck, but I can't decide between the Losi JR-XT, the Associated RC10T and the Traxxas Blue Eagle. Can you help? Your mag is great. Keep up the good work.

JESSE SMITH
Fullerton, CA

I'm sorry to hear about your Ultima's problems, Jesse, but with the rising cost of a good exorcist, I think you've made a wise choice by deciding to buy a new electronic speed controller.

The 610RV and the 410-M1c are both excellent high-frequency ESCs. They have regenerative circuitry, and they're priced within \$10 of each other. You only have to decide whether or not you want reverse. You may also want to check out Novak's

new 410-M5 speed controller, which comes very close to matching the performance of the more expensive 410-M1c.

All three of the trucks you've listed are good, Jesse, so it's merely a matter of personal preference. FM

ASTUTE RECRUIT

I'm a big fan of your magazine, and I'm now the proud owner of a Tamiya Astute. I'd be very grateful if you could put a Track Report in an upcoming issue; if you already have one, could you send it to me?

THOMAS GAVIN
West Barnstable, MA

PICK A WINNER!



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Thomas, Jim Dahl wrote a Track Report on the Astute for our March '90 issue. A copy of the article is on its way to you. LA

GEE! I DON'T HAVE IT SO BAD (PART I)

For the past several years, I've been an avid *R/C Car Action* reader. Next to "Readers' Rides," I think my favorite part of the magazine is reading about how other hobbyists use and abuse their vehicles. Recently, my R/C truck and car (and all the associated equipment) were put to the ultimate test. Unfortunately, putting them through this test wasn't my choice.

On June 10, 1991, my wife and I were

forced to evacuate our home in Clark Air Base in the Philippines, owing to the threatening nature of a volcano (Mt. Pinatubo). On June 12, it erupted in several violent explosions. During the next three days, the explosions continued and our house and everything in it was totally destroyed. Under the pressure of the building volcanic ash and rain, the roof eventually collapsed.

On June 20, we were allowed to return to our homes to gather a few possessions. In the rubble of my storage shed, I found the scattered pieces of my Blackfoot and my RC-10. My Novak T-4 electronic speed controller remained intact, buried in about 6 inches of volcanic ash and mud. I took it back to my hotel room in Manila and put

it through a little test to see how well it had held up. I managed to simulate an R/C circuit with a battery and a couple of other components. Without cleaning the ESC, I installed it in the circuit—"as is." I know that John Rist puts all of his "Scoping Out" victims through dead-short tests; I figured that I could do the same. You can pass it on to Mr. Rist that I've discovered the perfect way to short a circuit. As soon as I applied the current, my ESC went up in smoke. Volcanic ash and dust are very conductive; just a little will short out a circuit. After the initial meltdown, I opened up the ESC's case. As well as Novak units are sealed, this one was full of volcanic dust anyway. After my experiment, I knew

(Continued on page 10)

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LETTERS

that the rest of my equipment was totally lost. In addition to being exposed to the volcanic matter, it had been exposed to the elements, and typhoons had been plaguing us since June 13.

Until my wife and I can start picking up the pieces of our lives and return to a routine, I'll have to be an R/C enthusiast by keeping in tune with your magazine and my dreams. I just wanted to share this experience with you and warn others to keep their valued R/C vehicles out of the range of volcanoes.

ALAN J. GIEBLER
Philippines

Alan, what can I say, except that you've still got your health? FM

CONNECTOR REQUESTER

I'd like to compliment you on a very informative magazine. I was wondering if you've done a report on connectors. Could you list the manufacturers who supply them? Keep up the great job.

JOE TRAJANO
Long Beach, CA

Joe, check out John Rist's "Connector Inspector" article in our January '91 issue. In the October '91 issue, he reported on a new connector from Team Astro in "Zero Loss is Boss." Here are the addresses of the manufacturers that are mentioned in those articles:

Team Associated, 3585 Cadillac Ave., Costa Mesa, CA 92626.

MRC/Tamiya, 200 Carter Dr., Edison, NJ 08817.

Sermos R/C Snap Connectors, Cedar Corner Stn., P.O. Box 16786, Stamford, CT 06905.

Bold Creations, 1305 Abbey Rd., Round Rock, TX 78681.

Race Prep, 20115 Nordhoff St., Chatsworth, CA 91311.

Deans Connectors; distributed by Ace R/C Inc., 116 W. 19th St., Box 511C, Higginsville, MO 64037.

Trinity; distributed by Speedworks, 1901

E. Linden Ave. #8, Linden, NJ 07036.

Corally; distributed by Du-Mor R/C Inc., 1002 Union Landing Rd., Cinnaminson, NJ 08077.

Litespeed, P.O. Box 4765, Spokane, WA 99202.

Team Astro, 13311 Beach Ave., Marina Del Rey, CA 90202. LA

SCARY PSYCHIC READERS

I'm a newcomer to the R/C world, and I'd like to thank you for the most informative and helpful magazine around. I'd like to suggest an article or two about some troubles I'm encountering.

How about doing a "dictionary" of R/C terms (I still don't know what caster is, or what timing means and how it affects motor performance!). I'd appreciate any spare back issues that you could send me to help me through. It's very hard to find them here, and they cost about \$10 each! Since I'm short of American currency, I can't subscribe. I read issues at newsstands and inside stores, but the owners don't seem happy about it.

Keep up the great work, and please tell Mr. Chianelli that he's my idol!

EINAR C. ERIKSEN
Philippines

Please, Einar, don't anger the local merchants! I'll see what I can do about sending you some back issues.

Ya know, sometimes I'd swear that some of our readers are psychic. We just started working on an R/C glossary, and here you are, asking for one. This is scary!

Chris Chianelli is your idol? I suggest that you seek professional help, or get yourself the biggest can of hair mousse available. FM

TWENTY QUESTIONS

Which is better for competitive racing, your Fusion Speed RC10 CE project (July '91) or your Team Car RC10 (September '91)? I'd also like to know about the Futaba 1024 PCM and the Airtronics

Caliper 3P. In your opinion, which gives better access to controls during races and which is more capable of handling all the obstacles of off-road racing?

In your July '91 issue, you had a custom-made graphite battery brace, and I'd like to receive a photocopy of it, if possible. Which speed controller is better, the KO-Propo CX-III or the Tekin 411P? In the August '91, issue you featured Masami's RC10: how did he prevent the shrink-wrap he used to cover the speed controller from melting near the heat sink? Thanks. By the way, your magazine is great!

JASON PETERSON
Waterford, MI

Ahh, those age-old "which is better" questions. Well, Jason, in the hands of comparable drivers, the Fusion Speed RC10 and the Team Car will run neck and neck. It's up to you, of course, whether or not spending the extra money for the Fusion Speed chassis is worth it.

The Futaba 1024 PCM and the Airtronics Caliber 3P radios have basically the same functions and are more than adequate for any type of racing. On the 1024, however, you can switch from PCM (pulse code modulation) to FM—a slight advantage. As for the controls, the PCM seems to be a little easier to adjust during races, mostly owing to its thumb buttons and audible beeping when you adjust the trim. On the other hand, the Caliber has an LCD display that many racers say more accurately relays trim and other settings.

You can buy the battery brace you referred to from DA Graphite, 1235 Portola Ave., Spring Valley, CA 92077.

The Tekin 411P and the KO CX-III are serious racing ESCs. Although the CX-III has more FETs and a slightly lower operating resistance, the 411P is a high-frequency controller with torque limiting, and this makes it more desirable.

Even we aren't sure what kind of speed controller Masami uses! My guess is that his ESC might be a KO-Propo prototype, but Masami isn't talking. FM

(Continued on page 194)

New In
'92

RC-10 and RC-10T

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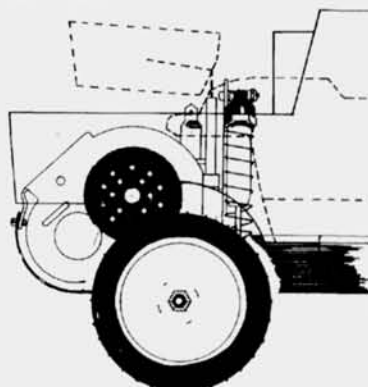
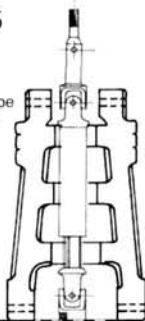
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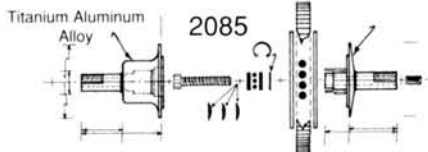
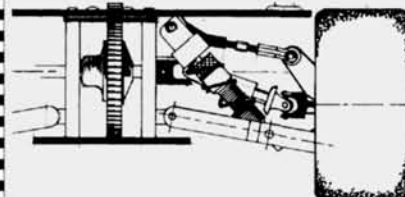
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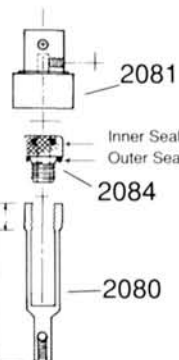
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Special Thanks for Rod Ward, Mike Bell and Team Riverside for support and R&D.



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PIT TIPS

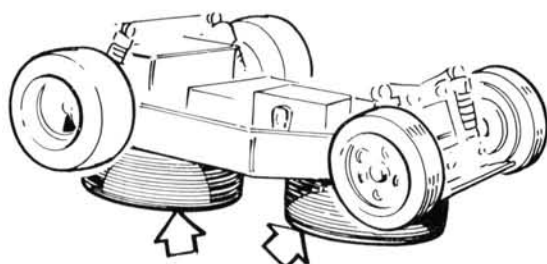
by JIM NEWMAN



RC10 BEARING CLEANER

Here's a way to thoroughly clean stock RC10 front wheel bearings. Put them in solvent, agitate them, and then put them on top of the air valve on a tire pump. Hold them firmly in place (and plug their center holes) with a pencil or a sharp dowel. A few quick blasts of air will drive the dirt and solvent out of the race. Warning: wear safety glasses while you do this.

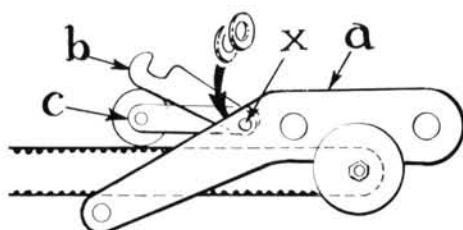
William Hegarty, Wakefield, MA



EMERGENCY CAR STAND

If you forget to take your stand to the track, just put a pair of spare tires under the car.

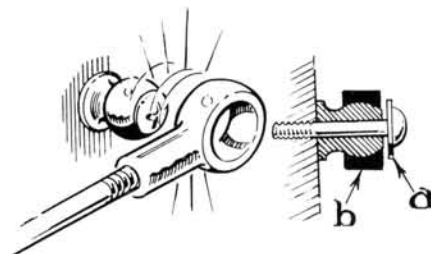
Harry Cheung, Clovis, NM



YZ-10 FRONT-BELT TENSIONING FOR ZX

Here's a way to avoid the front-belt slip that sometimes occurs in the Lazer ZX during hard cornering. Drill a hole (x) in the chassis stiffener (a) and, at the bend, position the wire loom (b) against the stiffener with its notch upward. Put both of the kit-supplied washers between the loom and a tensioner arm (c) taken from a YZ-10. The loom, which keeps the battery cables off the belt, and the tensioner arm should point forward so that they won't interfere with the body or the equipment.

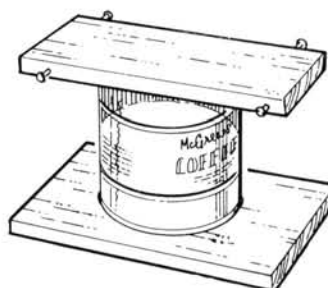
Paul Ragland, George AFB, CA



NO-POP BALL JOINTS

This tip was originally devised to prevent the trailing arms on a JR-XT from popping off, but it will work on any ball joint. Put a washer (a) that's larger than the hole in the ball socket (b) on the screw that secures the ball joint. This prevents the socket from popping off the ball.

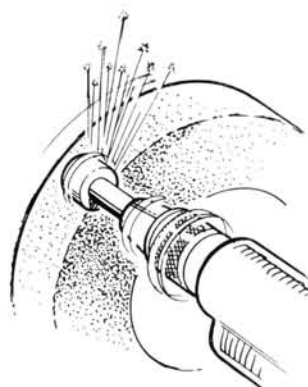
T. Bray, St. Charles, MO



INEXPENSIVE CAR STAND

To make this stand, you only need a can and two boards of the proper size. Fill the can with sand (to increase its stability), and hot-glue it to the boards. To prevent the car from slipping off, glue foam rubber to the top board. You can hook rubber bands onto the nails (shown) and stretch them over the car to hold it in place.

Neil Seeley, Arvada, CO



GRINDING SCREW HEADS

To reduce the outside diameter of a screw head, try this. Mount the screw in a drill chuck, and then turn on the drill while holding the screw head against a spinning grinder. For accuracy, it's best to use the grinder rest to support the drill. (Don't forget to wear safety glasses while doing this.)

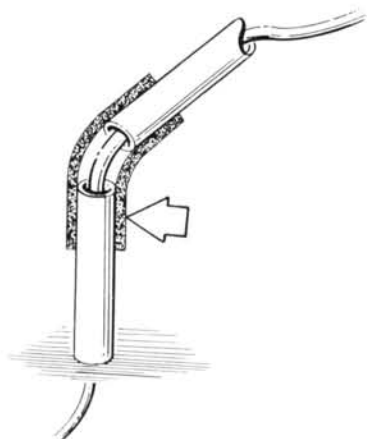
Leonard Glick, Long Beach, CA

PIT TIPS



CVA SHOCK PRE-LOAD

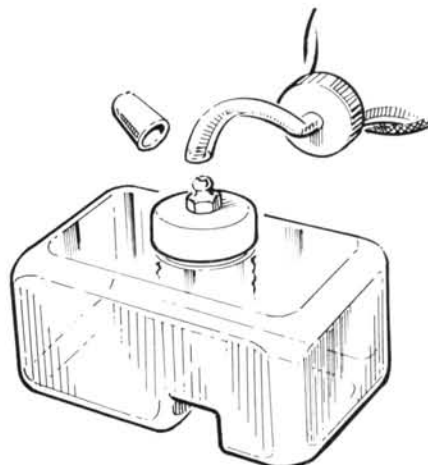
On Tamiya CVA shocks, move the plastic collars up and down until you find the pre-load spring settings that you like, and then glue the collars in place with CA. This is certainly easier than continually disassembling the shocks and changing springs. Just remember that this modification is permanent! *Shem Guthrie, Cairns, Queensland, Australia*



FLEXIBLE ANTENNA TUBING

You can install this now, or wait until the tubing has broken! Cut the plastic antenna tubing so that there's a 1/2-inch gap in the middle of it. Cover the gap with a piece of rubber tubing. If the car rolls, the antenna tubing will be able to bend and then immediately spring back when the car is on its wheels again.

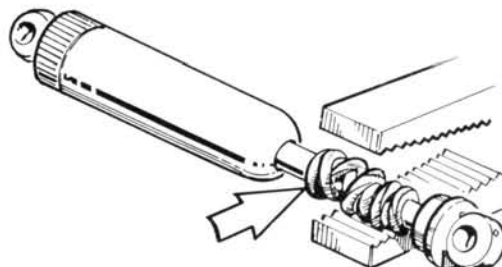
Scott Robison, Johnstown, PA



QUICK REFUELING

Drill a hole in the fuel tank cap, and install a 6-32 screw-in pressure fitting. Screw the cap on tight, fill the tank with a squeeze-type fuel bulb (just be sure there's a vent through which air can escape while you're filling the tank), and seal the pressure fitting with an antenna cap. In addition to reducing the time it takes to refuel, this setup keeps dirt out of the tank!

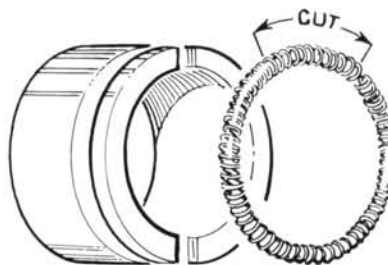
Steve Zuniga, Garden Grove, CA



PISTON-ROD PROTECTION

When you disassemble a shock, the instructions often suggest that you wrap cloth around the rod before you grip it with pliers. The oil on the rod makes this extremely difficult, and the result is a badly scored rod. Here's a better idea: wind a rubber band around the rod several times.

Cheah Sin Poh, Singapore



ZR-1 'VETTE CLUTCH ADJUSTMENT

To enable the clutch to engage at higher rpm, remove about 12 coils from the springs that surround the clutch shoes. You can remove more, but with this arrangement, it's easy for the 'Vette's front end to pop up on dirt surfaces.

Stephen Murch, Henderson, Auckland, New Zealand

Radio Control Car Action will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Pit Tips." Send rough sketch to Jim Newman, c/o **Radio Control Car Action**, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

INSIDE SCOOP

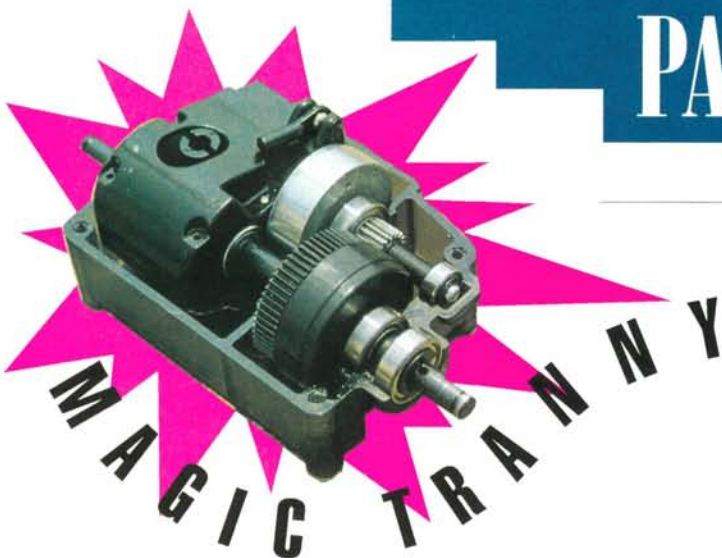
by CHRIS CHIANELLI

As directed by the Ayatollah of Radio Controlla, Commander Crash Chianelli reporting back to the faithful followers of the Grand High Exalted with pertinent information! I'm back from my latest espionage excursion with microfilm, spy shots and stolen communiques that read as follows:

The team that runs the Chevy-powered Intrepid—an extremely successful combination—has granted Parma (and *only* Parma, according to them) the right to reproduce the body in 1/10, 1/12 and 1/8 scales. Full decal sets will also be available for the 1/8- and 1/10-scale versions.

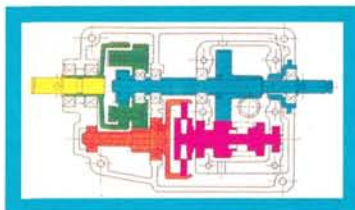


PARMA EXCLUSIVE



Here's a look inside the Kyosho CCVT (compact constant-variable transmission) that's being tested in the 1/10-scale Pathfinder. The tranny has a manually shifted forward and reverse. The mystery, however, is: how does it vary the ratio? Could it have beveled, conical clutch disks with an inner "camera/iris-type" clutch plate that responds to centrifugal force by increasing in diameter, and thus causing a "ballooning pinion" effect? That's how a motorcycle (the Rotron) of days gone by worked—sort of. Its pulley walls moved toward and away from one another, and this could perhaps be likened to the action of the clutch disks. When the pulley walls moved, the giant V-belt would move in or out on them, thereby changing the ratio. I could be completely wrong, but so what; I can take it if I am!

The magic does, however, seem to be within the polished-aluminum "flywheel" at the center of the tranny. Other theories are, of course, welcome. It's not clear whether the Pathfinder will ever make it to this country. If it does, it will, no doubt, be expensive. Let me know if you're interested in this car, and I'll pass it on to the powers that be. Bye-bye.



ALWAYS BE ON GUARD



Here's yet another useful gadget from that inventive Viennese company, SCI Inc., which is headed up by Austrian genius Dr. Manfred Schindler. This plug-in unit—the Guardian—lets you know how your BEC is working: a yellow light means the

voltage is too low, a red one means it's too high and a green one means everything is OK. Unlike a voltmeter, the LED response is instantaneous. Now you can quickly identify low-voltage spikes that occur during hard acceleration and cause radio glitches. You can



Lately, it seems as if everything that Team Associated driver Cliff Lett touches, he takes home. Shortly after driving his Yokomo to a win in the 4WD Class at the World Championships (he thrashed everyone, including Master Masami!), Cliff went on to claim the Kyosho 1/8-scale World Challenge with his Paris Rex-powered Pirate M-1.

Now, many team racers walk around with loads of natural talent and many walk around with beautiful girls named Gloria. Before walking around or going out on the town, however, it's obvious that Cliff Lett finishes his homework. He practices and practices, and then he walks right into the winners' circle...!



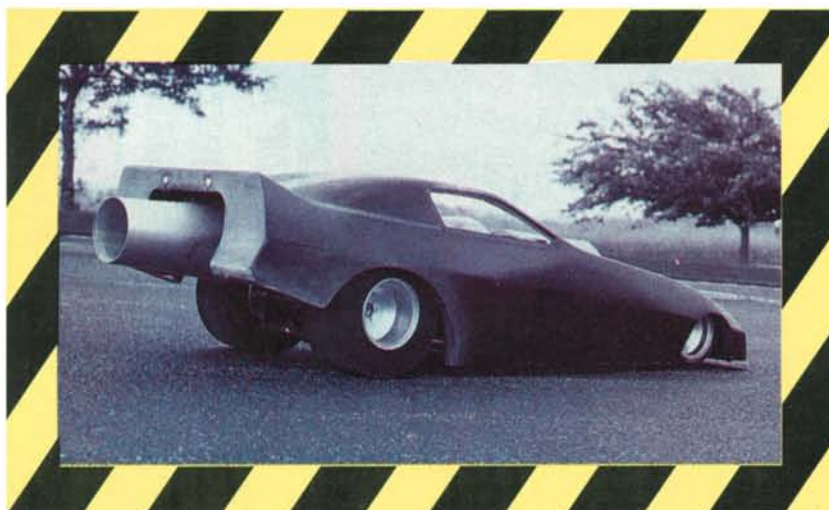
also detect high-voltage spikes (caused by a malfunctioning BEC) that can damage your receiver. Owing to the Guardian's next-to-nothing weight, you can leave it plugged into your car's radio as a permanent monitoring system.

I often receive letters with questions such as, "How *do* you get those spy shots?" Well, Batman isn't the only one with wonderful "toys," and I often use mine—in this case, a submersible spy-cam code-named "Seawatcher"—to get those special spy shots. Why have I decided to reveal this highly secret R/C spy device? Well, my beautiful Far Eastern contact, who built the Seawatcher and many other espionage devices, has



operated with it for years throughout the Pacific rim. I'm sorry to report that, while she was using it in Sammyaku, Japan—an isolated northern province—it met its demise. It happened off the west bank of the Kitakami river, adjacent to Kitakami Flats—a secret R/C world-speed-record testing ground. Unfortunately, the covert action coincided with the Kawasaki Jet Ski team's practice for the Kawasaki Water Cross event. The downstream devastation occurred just as the Seawatcher was bearing down on what appeared to be a 200mph speed run by an electric Kyosho car. Little, save a few yellow particles floating on the surface, was left of the Seawatcher. Allegedly, in an attempt to cover up the incident, Mr. Suzuki (Kyosho's owner) told reporters that Sesame Street celebrity Big Bird, who was vacationing in the area, had been run down by nine consecutive jet skis while taking a dip. Mr. Suzuki went on to say, "It's a very dark day; this great tragedy would never have happened if Big Bird had remembered to wear a water wing."

UNDERWATER COVER



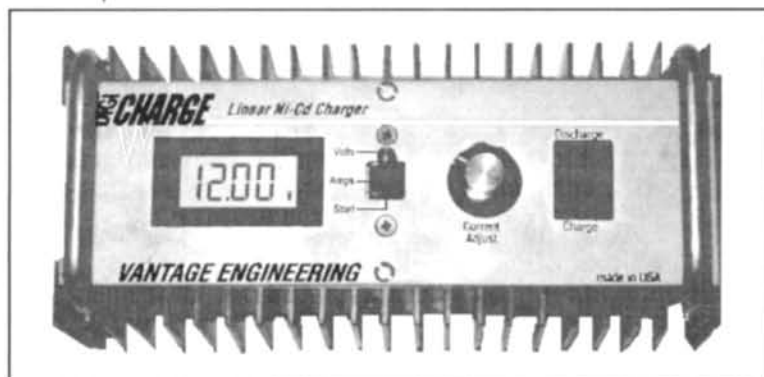
World-famous *Car Action* columnist Dave Sproul has just released this photo of his latest high-powered project—a 1/4-scale fiberglass Corvette Funnycar. Its chassis was totally scratch-built of 5/16-inch chrome-moly tube, so it's ultra-strong and very light. Sitting under the hood is a Dynamax ducted-fan unit driven by a Schnuerle-ported O.S. .91 (with a tuned header pipe) that turns more than 20,000rpm! No wonder Dave predicts speeds greater than 150mph. I've heard reports

that Dyno Dave's threatening endeavor has the Kitakami Flats Speed Society in Japan very nervous. Good luck with Project Danger Zone, Dave!

PROJECT DANGER ZONE 150+ MPH!



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VANTAGE ENGINEERING

TRINITY AT INDY

At this year's Indianapolis 500, Trinity Products made its debut as an associate sponsor of Mike Groff's Euromotorsports Lola. Based in Indianapolis, IN, the Euromotorsports team is owned and run by Antonio Ferrari, Ph.D, M.E. Although Fendi is the Lola's primary sponsor, it was also picked up by Hawaiian Tropic before the 500. On its



nose, between the Fendi logo and the car number, the car carries the Trinity logo. Ernie Provetti, president and CEO of Trinity, attended the race and presented Ferrari with a 1/10-scale R/C replica of the no. 50 Fendi Lola. Based on a TRC/CompositeCraft Lynx II, the model is powered by a Trinity motor and batteries. Our Grand High Mystic

Ruler of the Oval Table, Steve "Pontiff" Pond (the mortals' only contact with the Ayatollah), was, of course, there to bring joy and meaning to the occasion.

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(Graph shown represents actual computer readout of Reedy Modifieds motor.)

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OVERALL EFFICIENCY

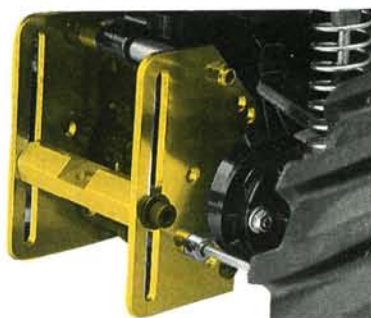


16 JANUARY 1992 21

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PUBLISHER'S PAGE

by LOUIS V. DeFRANCESCO JR.

AIR AGE ON THE RUN

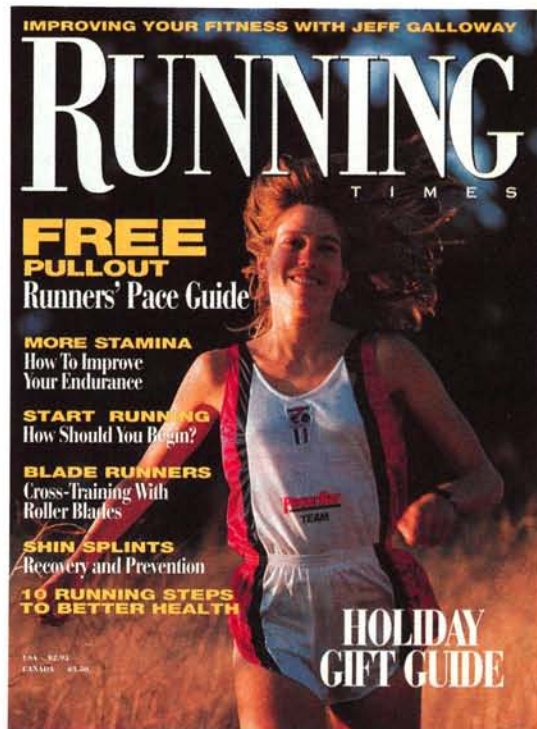
ON September 6, 1991, Air Age formally announced to the publishing world its acquisition of *Running Times* magazine—the second-largest running magazine in the country. The magazine was previously owned by LFP, Inc., of Beverly Hills, CA.

Running Times, a monthly, is for people who are devoted to running, fitness and the running lifestyle. With its acquisition of *Running Times*, Air Age enters the fitness market.

Our company's success in publishing leisure-time and hobby magazines has compelled us to explore other markets and has challenged us to diversify. After thoroughly researching the running market and seeing its explosive media potential, we know that our "new" publication is destined to be a winner.

But what does all this mean for our R/C publications group?—even more progress, of course! In 1992, we plan to step up our marketing dramatically and to deliver higher-quality magazines (with even more reader bonuses) and more books and special issues. *Our overall plan is to maximize the R/C market and gain even more "critical mass" while diversifying into other viable markets.*

My grandfather, the late George C. Johnson, was a great publisher of famous detective and romance magazines of the '20s and '30s as well as the founder of one of our magazines—*Model Airplane News*, which is now celebrating its 62nd birthday. Unfortunately, he died in 1944 and, without his direction, many of his magazines faded. His entrepreneurial spirit, however, lives on with the new Air Age Publishing; we've taken over where he left off and plan to reach new heights—heights he never imagined. ■



**Reader's Ride
of the Year**

SCRATCH-BUILT

BATMOBILE



by JOHN HUBER

ONCE IN a while, something truly amazing finds its way into our office. Last year, it was the Landmaster vehicle built by Robert Haverfield; this year, it was Ewald Schuster's Batmobile. When you see just how much work and ingenuity went into this project, you'll know why we unanimously chose it as our 1991 Reader's Ride Of The Year. Ewald and his friend Keith Peacock drove hundreds of miles from Guelph, Ontario, Canada, to let us (and you!) get a close look at the car.

This isn't just another modified kit at which someone threw generous heaps of cash; it's a

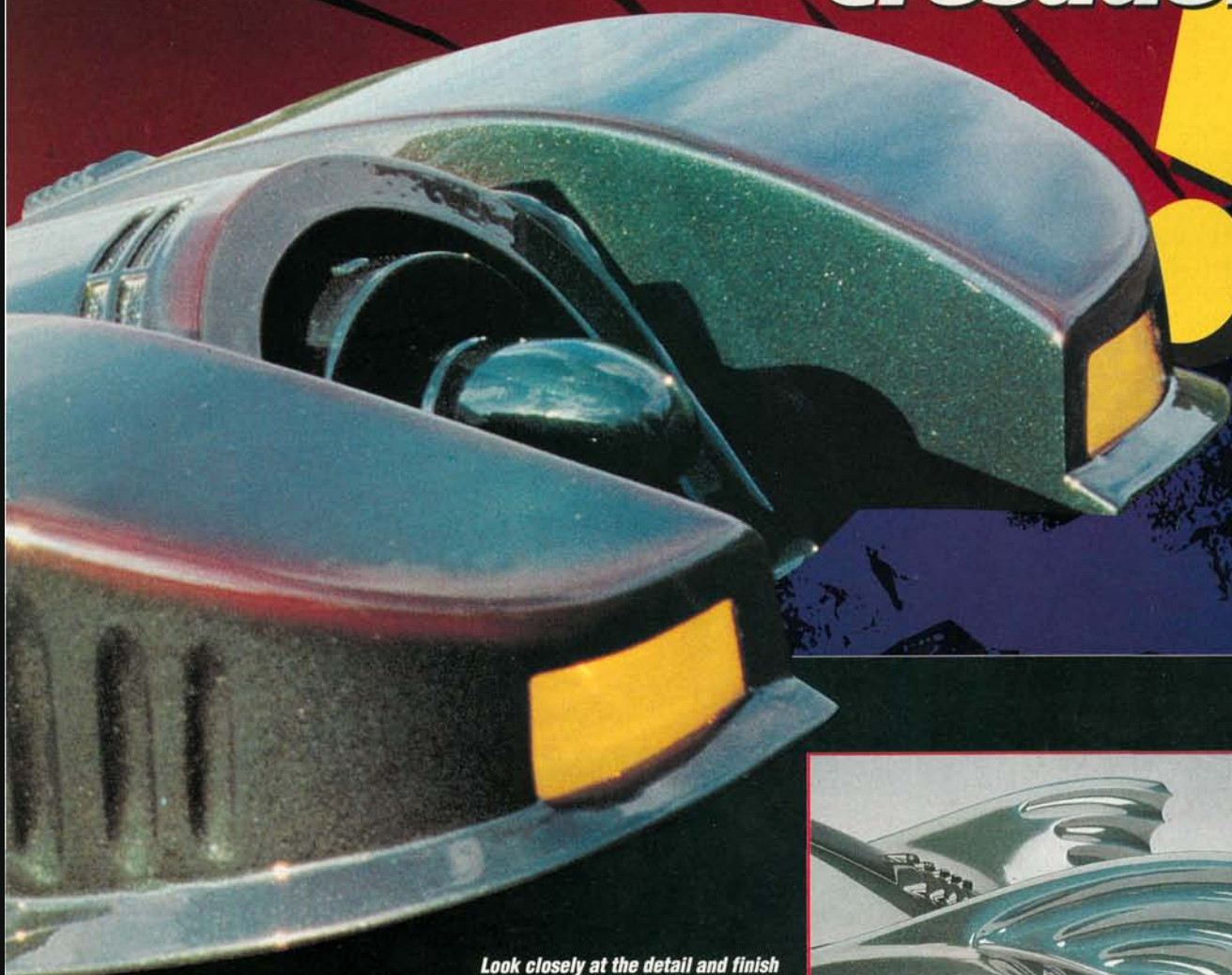
true marvel of time and craftsmanship. Most of its parts were made from scratch using relatively common materials.

HOLY SCRATCH-BUILTS, BATMAN!

Ewald had a model airplane ducted-fan unit that didn't work with the plane in which he had planned to use it, so he decided to try it in a car. At the time, the movie *Batman* had just been released and, when he saw the new Batmobile, Ewald knew what he wanted to build; the question was how?

There weren't any kits for such a project so, using a smaller plastic model as a guide, he made his own plans. Building around the fan

Cruisin' Caped Crusader!



Look closely at the detail and finish of the fins. They're made of several sheets of balsa that were glued together and carved to shape.



Air exits the body through the rear nozzle, and this provides thrust. Exhaust from the engine pours out of the four tail pipes.



Air for the ducted-fan unit enters the body through the front scoop. The headlights are functional.

PHOTOS BY JOHN HUBER & YAMIL SUED

unit, Ewald mapped out the car's dimensions and fashioned a frame by soldering together pieces of brass tube. It took a lot of time for him to create a design that would house the fan unit *and* all the radio gear.

Each corner of the car has an independent-suspension system and oil-filled shocks (from a Panda electric R/C car), and setting this up was no easy task. Steering is provided by two servos, because Ewald wanted to run the air duct through the car's center, so there was no way to connect the two linkages mechanically. This setup left most of the car's center area open for the air system.

YES, ROBIN, AND THERE'S MORE...

Of course, Ewald didn't plan to power this vehicle with air alone, so he had to create a drive system. He made a special spinner that helps to start the engine *and* drives a belt that transfers power to the rear wheels. He uses an auxiliary radio channel to control the clutch/brake system. This system consists of a lever that can be moved forward to engage the drive system and backward to brake the



Here's the clutch/brake system. The lever can be moved forward to deliver power to the rear wheels and backward for braking.



Because the fan unit and duct runs through the car's center, two servos had to be used for steering.



rear wheels. Ewald put silicone washers (to serve as "buffers") between the moving surfaces. The power is delivered through the clutch and into the drive shaft, which runs to the rear of the car's frame. That's not where the power stops, though:



This handmade starter cone also drives a belt that transfers power to the rear wheels. Notice the spring-loaded belt tensioner.



All the car's electronics are housed in a custom-built enclosure. The car's body is made of clear acrylic and is held in place by a custom-built frame.

B A T M O B I L E



Except for the duct tubes in the front and a few other small details, the entire body is made of balsa wood. A small battery that's built into the body powers all the lights.

In the center of this photo you can see the differential gears. To their left, are the gears that switch the car from forward to reverse.



"Making the body was tricky...it's built entirely of balsa wood...Ewald used steam to make curves in the wood, and he made the fins out of many sheets of wood that he glued together, sanded and carved to shape."

To start the Batmobile, you can raise the front of its body to access the starter cone. Hinges at the rear and a locking pin up front hold the body to the chassis.



the drive shaft can engage the rear axle in one of two directions. That's right—forward or reverse! Using another channel on the radio, Ewald can shift the gears so that they move in the direction he wants. And yes; this drive system also has a differential. A set of modified Blackfoot rims with foam tires finish off the chassis. This is a serious drive system, eh?!

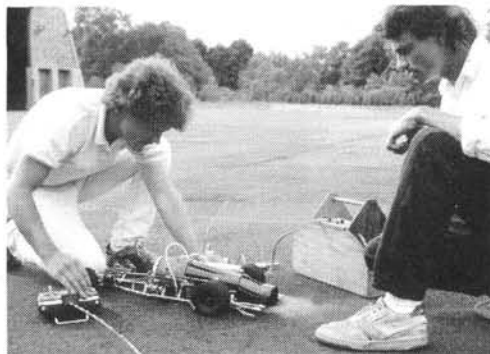
WILL BATMAN HAVE THE POWER?

For a powerplant, Ewald planned to use a nitro engine, so he also had to design a muffler system. Rather than just routing a pipe out through the side of the body, he channelled the exhaust out through four small tail pipes that exit the rear of the body. He used a lathe to fashion tips (just like those on the full-size Batmobile) on the ends of the pipes. When Ewald starts the engine, a stream of smoke pours from them.

WILL ROBIN LIKE THE LOOK?

Making the body was tricky. Although, I couldn't believe it until I saw it with my own eyes, it's built entirely of balsa wood, and I've never seen such a great finish on wood before!

Ewald made the body's sides first, and then he used wooden formers to build the hood, the intake scoop, the air-exhaust outlet and several other parts. To support the roof during construction, he built it over a balsa-sheeted frame. Ewald used steam to make curves in the wood, and he made the fins out of many sheets of wood that he glued together, sanded and carved to shape.



Here are Ewald and Keith starting up the Batmobile for its first run. Notice the smoke that's streaming from the tail pipes.

When Ewald finished constructing the body, he prepped and painted it. He was lucky to have an opportunity to see the car that was actually used in the movie at a car show. He took lots of close-up photos of it so that he would get the details just right. He painted the car and, to protect the paint and smooth out small imperfections, he applied several coats of clear lacquer. Then he buffed it, and the car was ready for show.

How long did this project take? Somewhere around 1,250 hours, and it cost approximately \$1,300!! Yowsa! When we ran the car, I was truly impressed. The sound of its engine and ducted-fan unit is great. Although we took it easy (it was the car's first run!), the car is surprisingly fast. Congratulations, Ewald. You really blew us away! What could possibly be next? Come on, people, let's see you top this one!

Parts List

Brass stock (all 1-foot lengths)

- 16—3/8-inch tubes
- 4—1 1/32-inch tubes
- 4—1/4-inch squares
- 5—3/16-inch squares
- 4—3/16-inch C-channels
- 2—2-inch sheets
- 2—1-inch sheets
- 2—1/8 inch tubes
- 1—1/4x1/16-inch sheet

Parts made on a lathe

- spinner
- clutch/brake system
- axles
- drive shafts
- muffler tips
- wheel hubs
- pinion-gear shaft

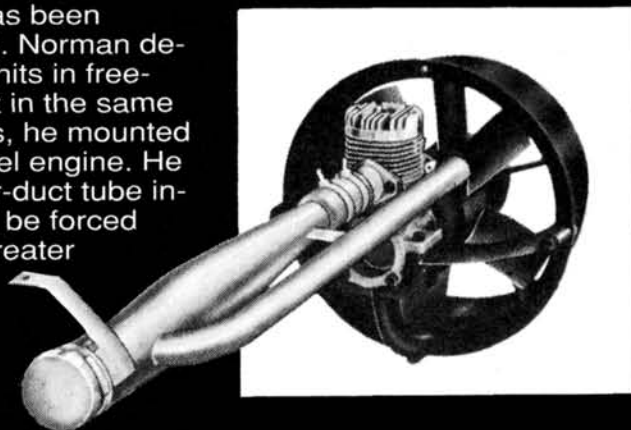
Other parts

- Lots of balsa wood
- Blackfoot rims
- foam tires
- Panda shocks with hard springs
- 6-channel radio
- Blood
- Sweat
- Tears

A DUCTED FAN FOR BATMAN?

Ducted-fan technology for R/C models has been around since 1949 when England's P.E. Norman designed and tested the first ducted-fan units in free-flight model airplanes. To provide thrust in the same way that it's provided on full-size jet engines, he mounted a multi-blade prop onto a conventional model engine. He put the fan unit in the center of a tapered air-duct tube inside the fuselage. With this setup, air would be forced out through the small end of the tube at a greater velocity than it would be inducted through the large end. This fan unit had about half the diameter of the prop it replaced.

For many years, Norman experimented with different fan designs in free-flight models until, in 1959, he made the world's first R/C ducted-fan model airplane. Today, many model airplanes use ducted-fan technology, and now, there's even a model car that uses it!



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- 5 Long front and new X-tra long rear oil dampers are hard-anodized and teflon-coated with stainless steel piston rods.
- 6 Narrow bulkhead and long arms provide unmatched control in the roughest sections and deliver precise steering.
- 7 High ground clearance with 2.1" of suspension travel in the front and a full 2.5" of travel in the rear.
- 8 Durable nylon materials prevent breakage of the suspension components.
- 9 American-made, 100% graphite chassis completely minimizes flexing.

"The consensus agreed (Scott Montgomery's car) was the most impressive car on the track."

Competition Plus, August 1991

"The Traxxas car looked good at all times."

Radio Control Model Cars (England), October '91

The TRX-1, driven by Team Traxxas' Scott Montgomery, impressed everyone at the Worlds Warm-Up and IFMAR World Championship races in Detroit. Only a handful of the cars on the track were box-stock; and of those, Scott's TRX-1 had the fastest qualifying time (4th in the A-main!). The TRX-1 comes fully loaded with all the special "team" parts and trick set-ups giving you the advantage over the competition. Ask for the new TRX-1 "Worlds Car" at your favorite hobby shop and see firsthand what world-class performance is all about.



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CIRCA 1978

TIME WARP

T A M I Y A

by STEVE POND

AS Executive Editor of *Car Action*, one of the jobs I face daily is ferreting out the latest racing technology.

Because of this, it's easy for me to get caught up in the high-tech wave but, recently, I took a long cruise down memory lane with a trip to a small local hobby shop. While browsing through the wares, hands in my pockets, I noticed a box—worn, torn and masked with a thick coat of dust—that brought back memories of my early



R/C off-road racing days. Tucked in the corner of a poorly lit dingy shelf, was a Tamiya* Sand Scorchers kit.

(Continued on page 35)



SAND SCORCHER



THE ROOTS OF OFF-ROAD!

"BUG"-GY BEGINNINGS

The Sand Scorcher dates back to 1978, and it was the first purpose-built, off-road R/C car. (Although cars that had all-terrain tires slapped on them to provide a little ground clearance had been offered before, this one



A SENTIMENTAL FEELING

By today's standards, the Sand Scorcher is about as crude as cars come. All of its suspension and drive-train components are cast of heavy aluminum, and its chassis is made of very flexible fiberglass. The car has an independent suspension, but the torsional springs that hold the suspension up are better suited to a Cadillac El Dorado, so the flexible chassis is really the only thing that enables the car to absorb bumps. The kit comes with oil-filled shocks, but they're also rather crude; the oil will leak from them in a matter of days.

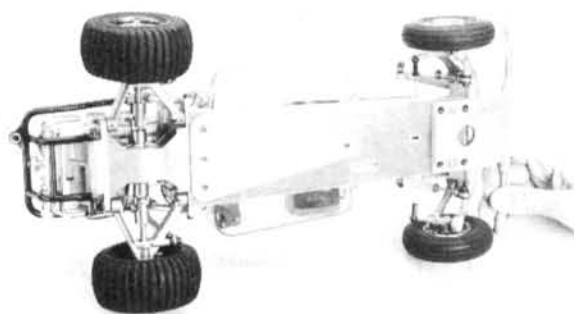
The Sand Scorcher's transmission is simply an overgrown gear-reduction unit with bulky gears, and it doesn't have a differential. There are only two gear

ratios available—slow and slower.

The gears are connected to a faithful old Mabuchi 540 motor, which is completely sealed in the transmission housing by a plastic end-cap. (This setup was designed to protect the motor from the elements, but it was later determined that it was better for cooling air to be able to reach the motor.)

The radio gear is also painstakingly protected from the elements by an elaborate, clear, molded casing that fills the remainder of the chassis. This is quite different from the completely exposed electronics on today's cars. With some care and plenty of sealant, you could actually run this car under water!

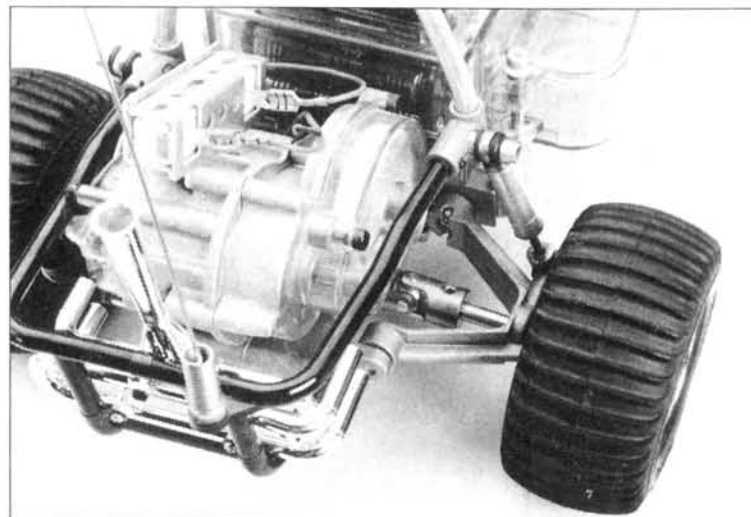
The Sand Scorcher is covered by a very heavy, injection-



actually had a suspension—however crude.) At a time when there was little R/C performance technology from which to draw, Tamiya took the next logical step and reproduced the technology developed for full-scale cars used in Baja racing—one of the U.S.'s most popular forms of off-road racing.

Tamiya modeled the 1/10-scale, electric-powered Sand Scorcher after the popular Volkswagen Bug (or "people's car"), which was designed in 1945 by Dr. Ferdinand Porsche. Although the Bug was originally intended only as a means of economical transportation, the flexibility of its design also made it suitable for several recreational applications. Its platform-style chassis, rugged construction and ability to accept large off-road tires, made this Volkswagen a shoo-in for Baja racing—hence, the Baja Bug.

During the trip home from the hobby shop, I was driven to distraction; I marveled at how, for 15 years, this kit could have survived the glances of thousands of customers without ever finding a home.



Unlike most of today's off-road cars, the Sand Scorcher doesn't have upper suspension links in the rear, so its camber changes radically during the suspension travel.

SAND SCORCHER

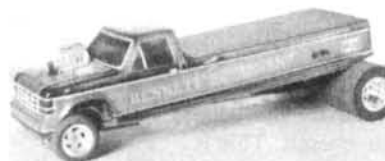
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NEW FOR '92



The Pro Puller IV made its debut at the Western Regionals in Wichita, KA winning the Sportsman Class with a full pull. The winning tradition continued at the Southeastern Nationals held in King, North Carolina winning both Open I 2 WDR and the popular Sportsman Class. Both pullers used batteries from PC Hobbies for the full pull wins. Zeta® Electro Speed controllers were used with Bennett Blue Dot Tires.

The Pro Puller IV uses the proven Pro Puller I style gearbox, but the gearbox is front mounted with chain drive to the rear axle. Gear ratios, as on all Pro Pullers, are easily changed to accommodate different size tires or track conditions. This is a deluxe chassis with ball bearings and adjustable hitch.

Bennett Equipment in the past has been known primarily for open class products. For 1992 the product line is being greatly expanded to include ALL NR/C TPA class pullers and monster truck racers. These products will include motors, tires, batteries, chassis accessories, hitches and Zeta® speed controllers. Custom dress up items and JPS aluminum wheels are also available.

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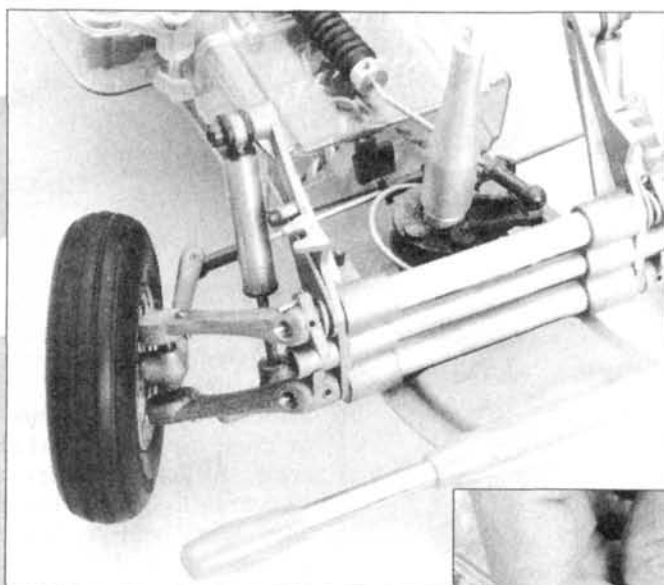
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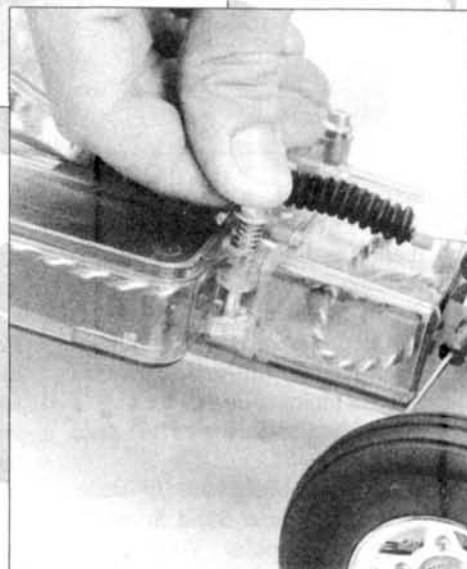
SAND SCORCHER



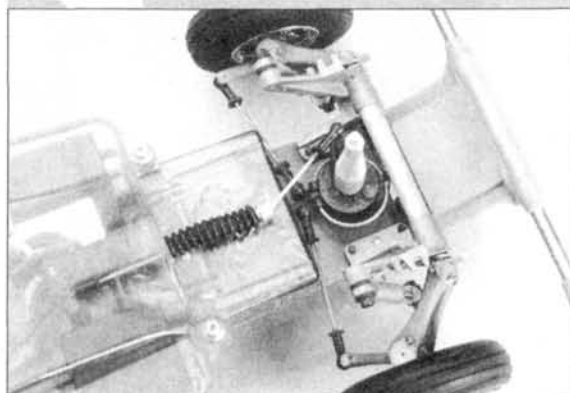
It's unusual to see a front-trailing-arm suspension these days, but this design came directly from Volkswagen. Also, notice that the front shocks don't have coil-over springs.

molded body that features the details of a modified Baja Bug. It has rearview mirrors, windshield wipers, lighting bezels, clear-plastic lenses for the lights, a windshield and side windows—even a "Zoomie" high-performance exhaust pipe. As you can imagine, the body weighs more than 10 of the bodies used on current electric racing machines.

Many of you might look at the Sand Scorcher, and ask, "Who would ever want that?" When this car was released, however, there weren't any RC10s or JR-X2s; it was the hottest thing going! You might also ask, "Why would you want one now?" Well, with all that's available for racing, performance isn't one of my reasons. It's like seeing an old car that you vividly remember your father driving



One of this car's best features is its sealed radio/battery compartment that's held closed with cam-lock fasteners. If you sealed all the wire exits with silicone, you could actually drive the car under water!



The Scorcher's servo-saver/bellcrank steering system works well, but it has a lot of slop.

you to the store in when you were a little kid. You wouldn't buy one to use for daily transportation, but you would have a sentimental bond with it that would be hard to break. The Sand Scorcher was my first off-road car, and it's a piece of R/C history!

**Here's the address of the company mentioned in this article:*

**MRC/Tamiya, 200 Carter Dr.,
Edison, NJ 08817.**

READERS' RIDES

"Readers' Rides" is our way of recognizing the unique, innovative—and sometimes bizarre!—vehicles that our readers have created. Send us a sharp, uncluttered, well-exposed color photo of your car or truck (no Polaroids or color copies, please!), along with a brief description, to Readers' Rides, Radio Control Car Action, 251 Danbury Rd., Wilton, CT 06897. If the Ayatollah chooses your photo, you'll receive a one-year subscription to Car Action, or an extension to your existing subscription. You'll also be eligible for the third annual "Reader's Ride of the Year Contest" in the fall of 1991. Write your address and phone number on your letter and on the back of each photo you send, in case we need to contact you.



■ TEXAS HANG-TEN?

From the crazy mind of Jeff Jerome of Arlington, TX, comes this off-road skateboarder! Jeff started with a Futaba FX10 chassis and then added a set of chrome Blackfoot rims with Pro-Line Masher tires, Associated and CRP oil-filled shocks, a Futaba Magnum Jr. radio and a Novak T-4 speed controller. Then he found the board and the rider to top it all off! What's next on Jeff's agenda? After he adds pin-spoke tires and a new, futuristic body, he plans to go racing!

■ MR. MAGOO AND HIS TRUCKS, TOO!

John "Magoo" Brumley of Leesville, LA, drives these two racing trucks. On the left is a Team Losi JR-XT with a Trinity stock motor, HPI wheels and RED racing tires. On the right is a Traxxas Blue Eagle



equipped with a Twister Pocket Rocket-17-turn motor and a combo of RED and Team Losi tires. Both vehicles use Tekin 410s ESCs and Futaba S148 servos, and together they're known as "Team Goodwrench" at Jeff's local track; just call him the "Intimidator."

■ VERY "COUPED" UP

John Insabella of Garwood, NJ, likes to build his own cars out of spare parts, and one of his finest creations is this '33 coupe. He started with a scratch-built chassis to which he added an adapted rear end that he took from a Midnight Pumpkin and a front end of his own design that uses Lunch Box spindles. The Futaba radio gear is hooked up to a Trinity Joel Johnson motor. John's finishing touches include a set of JPS diamond-spoke rims, Imex Olympic tires, a fully detailed Hemi engine under the hood and a Parma '33 Coupe body with a 1990 GM red color scheme.





■ DETAILS, DETAILS...

Jason Kubl of Rockford, IL, sent us this photo of his RC10L. To improve its performance, he added a narrow rear pod, a Tekin 610 ESC and mini-receiver and a Futaba radio. Jason tops it all off with an airbrushed body that's complete with such interior details as gauges and safety belts.

■ RIDE OF PRIDE

Ryan Pscotka of Bentleyville, VA, owns this JR-X2. Although he kept the car mostly stock, he did add a mini-bumper, Losi Logo rims and tires, a Losi H-arm conversion and a Tekin speed controller that's hooked up to a Futaba radio. All of this equipment and the nicely finished body add up to a well-rounded package that Ryan can be proud of!



■ TOP-O'-THE-LINE TRUCK

Finding the hottest trucks on the market isn't easy, but Ed Garcia of Grover City, CA, was one of the first in his area to get the new RC10T. He dyed all of its parts using Litespeed hot-pink dye, and then he added a Futaba Magnum AM radio and 9301 servo, a Novak 410 M5 ESC, a Trinity Pushed SER battery pack and Joel Johnson JJ Motor. This impressive truck's beautifully airbrushed body was done by Gisella Kaplan of Hobby Crafters in nearby Pismo Beach.

■ TRACK PATROL

Greg Stark of Crystal Lake, IL, started with a Parma Days of Thunder stock car, but he wanted something different. After finding a '34 Ford Vickie body, he decided to make the "Raceway Patrol." Greg added a Futaba radio and ESC, Duratrax foam tires, a RAM flashing light bar, JPS aluminum wheels and a blower from a Clod Buster. To ensure that this car can catch even the fastest crooks, Greg uses a Speedworks Pole Position motor and a 7-cell battery.



by FRANK MASI

YOU'VE seen them gracing the covers of automotive magazines. You may have even caught a quick glimpse of one as it whooshed by on the

its estimated top speed in miles per hour! Wow!

Most of you are probably familiar with Kyosho's Scale Series. Every line and seductive curve of the famous full-size, high-performance cars is accurately replicated on these 1/10-scale models. Kyosho has

when it arrived at the Car Action office, shouting, "Mine! Mine! Mine! Keep back! It's mine!" Unfortunately, this is standard operating procedure if you want to get the "good stuff!"

THE KIT

In most Kyosho kits, everything is neatly packaged, and this one is no exception. Most of the mechanical components are in separate, numbered bags, which are grouped according to specific assembly steps. Some of the engineering highlights, such as the pre-built differentials, are displayed in a blister pack so that they're the first items that catch your eye when you open the box.

The chassis platform is an injection-molding masterpiece. It consists of a large ABS-plastic tub that houses

highway. Of course, I'm talking about the "super-cars." Even their names—Ferrari F-40, Lamborghini Diablo, Porsche 959—evoke images of all-out, blistering speeds; of streaking around a test track or along Germany's famous Autobahn, where no speed limits exist.

Another player has entered the game, and it stands out, even in such fast company as this—the XJ-220 Prototype. It's low-slung and powered by a howling turbocharged V-6 engine, and "220" stands for

taken this idea one step further with its new Super-Scale Series. They're incredibly detailed, working models of the full-size cars they represent, right down to the valve covers on their engines and the instrument panels in their detailed interiors.

One of the first Super-Scale cars to be produced is the XJ-220 Prototype. Having read about the full-size super-car for years in automotive magazines, I literally dove upon the colorful Kyosho box

Super-Scale screamer

K Y O



PROTOTYPE



and protects the radio gear. The suspension components are attached to this tub.

In the rear, the transmission and the suspension are connected to the main chassis tub by two pieces of square aluminum stock. These aluminum bars come drilled with many mounting holes that enable you to adjust the chassis to fit different Super-Scale bodies.

The rear suspension consists of an independent,

double-wishbone configuration that's damped by a dual-shock setup. Don't get your hopes up to set blistering lap times at your local track, though; the shocks are mostly show, not go (they aren't oil-filled). On the plus side, the suspension parts are beautifully molded and give the car an incredibly realistic look.

The Super-Scale chassis' drive train is ingenious; its front and rear bevel-gear dif-

ferentials are coupled by a drive shaft. Most 4WD systems of this type use the same drive ratios for the front and the rear, but the XJ-220's transmission has a unique "ratio splitter" that allows the front tires to rotate slightly faster than those in the rear. This "overdrive" virtually eliminates oversteer, but it gives the XJ-220 a large turning radius.

S H O PE XJ-220



PHOTOS BY JOHN HUBER

XJ-220



S P E C I F I C A T I O N S

Type Scale Car
 Scale 1/10
 Price \$299.95

DIMENSIONS:

Overall Length 23.1875 inches
 Width 9.375 inches
 Wheelbase 12.125 inches
 Front Track 7.5 inches
 Rear Track 7.75 inches

WEIGHT:

Gross (with battery) 4 pounds,
 11.8 ounces

BODY:

Type XJ-220
 Material Polycarbonate

CHASSIS:

Type Molded tub
 Material Plastic

DRIVE TRAIN:

Primary Gear
 Transmission Gear/shaft
 Differential(s) Beveled gear
 Bearings/Bushings Oilite bushings

SUSPENSION:

Front: Type Dual A-arm
 Damping Single-friction coil-over
 Rear: Type Dual A-arm
 Damping Dual-friction coil-over

WHEELS:

Front: Type One-piece chromed nylon
 Dimensions (DxW) 2.2x1.375 inches
 Rear: Type One-piece chromed nylon
 Dimensions (DxW) 2.2x1.75 inches

TIRES:

Front/Rear Treaded rubber

ELECTRICS:

Motor Stock 05 LeMans

Battery 6-cell stick or saddle pack*
 Speed Controller Three-step forward
 mechanical

OPTIONS AS TESTED:

Futaba 2PBKA radio, R102JE receiver and S-132H servos; Trinity assembled SCE battery (stick pack).

COMMENTS:

As an avid R/C racer, I found building the XJ-220 to be a welcome change. It amazes me that Kyosho has the resources to produce such a detailed kit. The cost of tooling the injection-molded parts alone must be staggering. Constructing the complicated XJ-220 chassis may be a little beyond the capabilities of novice modelers, but the instructions are up to Kyosho's excellent standards. To top it all off, the XJ-220 was a blast to drive around a deserted parking lot. Now I remember why I became interested in R/C—it's fun!

*not included

KYOSHO

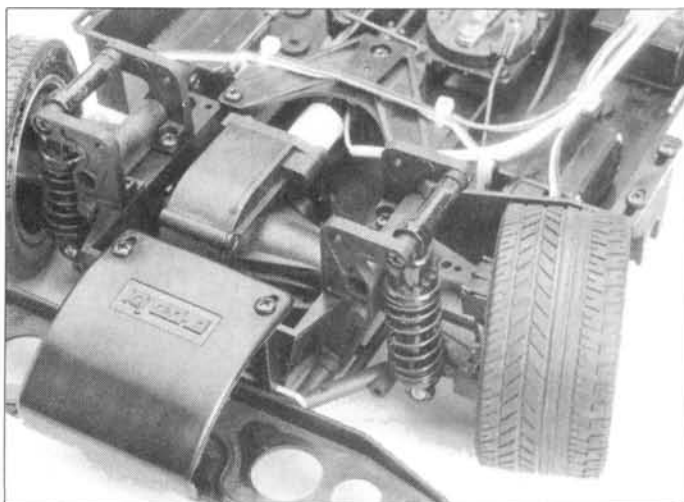


The Kyosho Super-Scale Series will appeal to many enthusiasts: racers looking for something a little different; full-scale auto buffs looking for a scale model; and beginners who want something to bash around on dead-end roads or in parking lots.

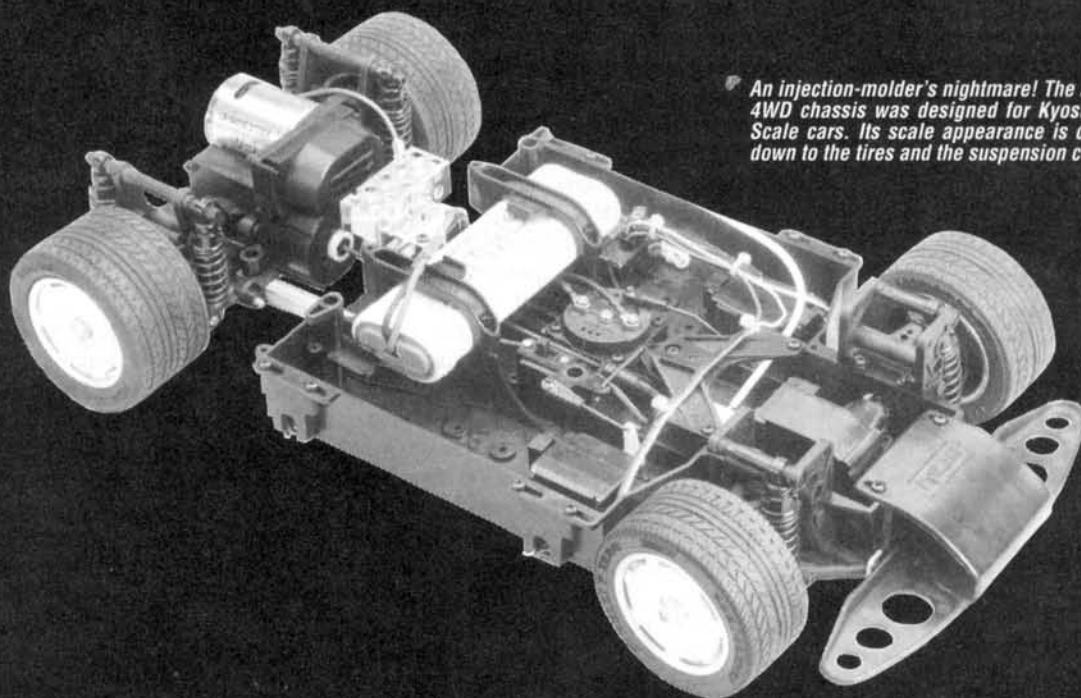
Up front, the XJ-220 has a double-wishbone suspension similar to that on the rear, except that it uses single-shock setups. Steering is handled by a unique sliding rack (with its own servo-saver) that's incorporated in the main chassis tub.

On to the good part, or why

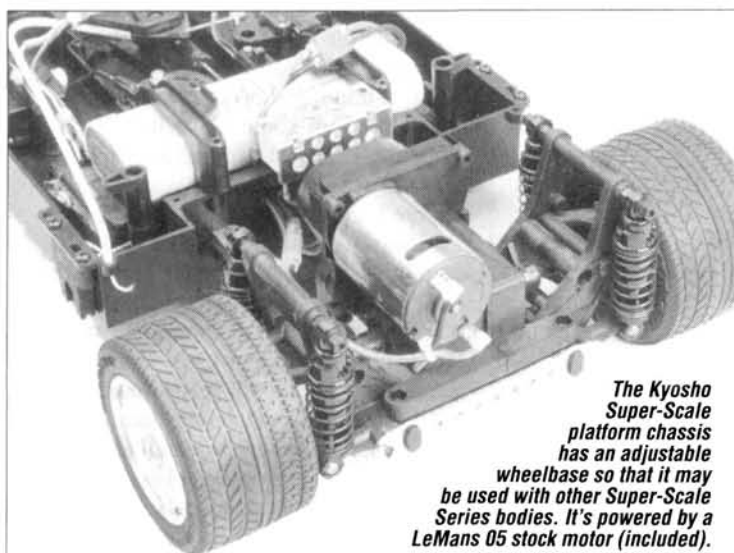
this car is called "Super-Scale." The wheels are beautiful two-piece units that have an inner "deep-dish" design and an outer disk, mirroring the full-size car's wheels. The kit's crowning glory is its incredibly detailed body and interior. Like Kyosho's Scale Series cars,



The XJ-220 has four-wheel independent suspension and double-wishbone suspension arms. The shock absorbers don't provide any damping; they're for show, not go.



An injection-molder's nightmare! The shaft-driven 4WD chassis was designed for Kyosho's Super-Scale cars. Its scale appearance is carried right down to the tires and the suspension components.



The Kyosho Super-Scale platform chassis has an adjustable wheelbase so that it may be used with other Super-Scale Series bodies. It's powered by a LeMans 05 stock motor (included).

the Super-Scale cars have polycarbonate bodies with many molded-plastic add-on parts that greatly improve the cars' scale appearance. What really makes the Super-Scale cars stand out is their detailed interiors, and the XJ-220 has a scaled-down version of the full-sized car's V-6 engine.

ASSEMBLY

As with other Kyosho kits I've built, the quality of the XJ-220's parts is excellent. I was amazed that Kyosho had the resources to develop

tooling for this kit's myriad injection-molded parts. If you know anything about plastic molding, you'll realize that Kyosho has invested a small fortune in this chassis; the molded parts are of superior quality. Enough of that—on with the assembly!

If I said that the XJ-220 went together quickly and easily, I'd be misinforming you. The truth is, it will take a significant amount of time, skill and patience to complete this kit. Not to sound conceited, but I've probably

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Novak 410MIC '99⁹⁹

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XJ-220

built more than 50 R/C cars, and few were more difficult to assemble properly than the Super-Scale chassis. The bottom line is this: Dad, if you plan to buy this kit as a good father/son project, be prepared to do more than your fair share of the work, or Junior will sprout more gray hair than you have. It isn't impossible to assemble this model properly, it's just a relatively sophisticated piece of work and you must put it together meticulously if you want it to function properly.

Pay particular attention to the transmission's assembly; the ratio splitter is especially easy to botch. It's good to read the instruction sheet before you begin. More than a dozen parts compose each side of the front suspension, so take your time, and scrutinize the exploded view in the manual. Some of the key suspension parts are designated for the left side of the car and some for the right, so pay attention! Also, to allow the suspension to move freely, be sure to leave a small gap between the steering knuckles and the pivot balls that secure the steering knuckles to the suspension arm. The front and rear suspension assemblies are very similar, so once you've completed the front, the rear should be a snap.

The instruction manual has an excellent radio-gear installation diagram that simplifies an otherwise complicated task. The XJ-220 kit supplies Kyosho's high-quality, rotary speed controller with built-in BEC circuitry, which eliminates the need for a separate battery pack to power the receiver. I like electronic speed controllers for racing, but this isn't a race car so the kit's speed controller is more than adequate. You can easily install an ESC if you want to.

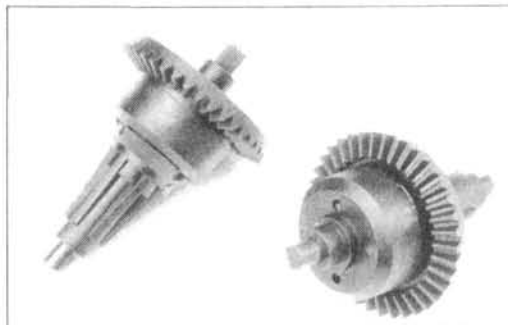
The car has another neat feature: the chassis' versatile battery-mounting system allows you to use either stick or saddle-pack batteries.

After I had finished, I noticed a little binding in the drive train, probably owing to the kit's metal bushings. To remedy this, I propped up the car so that its wheels weren't touching the ground, and I ran the motor for about five

minutes, during which time the binding was reduced significantly. I'm sure that the more I drive the car, the freer the drive train will be.

RADIO GEAR

All I needed was a 2-channel transmitter and two standard servos (one to operate the speed controller and the other to handle the steering). I chose



Here are the XJ-220's bevel-gear differentials. Even the diff housings have scale appearances! The pinion gears on either end of the drive shaft drive the ring gears that surround the housings.

a Futaba* 2PBKA Magnum Junior radio and two Futaba S-132H ball-bearing servos. All the necessary hardware is included in the kit, so installation was a breeze.

The task of motivating the XJ-220 fell to the included LeMans 05 Stock motor. If you want to achieve ballistic speed, do yourself a favor and pick up a hotter stock motor. For boulevard cruising (for which this car was intended) the LeMans is fine.

BODY DETAILING

The time you spend painting and trimming the body and its interior will be time well spent, because the end result is nothing short of spectacular.

I picked up some Coverite* Black Pinstripe Tape and outlined the window areas with it. When this was done, I covered the windows with Dahm's* Pro-Mask. Painting the XJ-220 couldn't have been simpler: the whole car is silver! No problem! After the paint had dried, I used some of Custom R/C Graphix* Pin-Line tape to accentuate the body's seam lines. The kit included super-detailed decals that add to the finished car's overall realism.

With the body complete, I assembled its interior. The molded-polycarbonate

(Continued on page 93)

EXPLAINING just how awesome fuel-powered buggies are to people who race electric-powered cars is like trying to explain the taste of your favorite dinner dish. Other people can't completely understand until they taste it themselves!

Fuel-powered cars have always had the reputation of being difficult. Early engines were hard to keep running, and the support hardware was considered expensive. Recent advancements in engine and chassis technology, however, have made engines more reliable and, as the cost of racing electric-powered cars increases, many people are looking at fuel power as an alternative.

Whenever the words "nitro-powered" are mentioned, most people think of 1/8-scale cars. The increasing popularity of these piston-pounding vehicles has also led to the development of a 1/10-scale class. Kyosho was once the only manufacturer to offer such a vehicle (the Rampage off-road car and, most recently, the Outlaw Rampage truck), but Schumacher* recently laid down the gauntlet with its Nitro 10 racing truck, and it looks as if Schumacher is wielding a big sword!

HERE'S WHAT YOU GET...

Based on the popular Shotgun electric-powered racing truck, the Nitro 10 features a very strong, stamped-aluminum tub chassis; a four-wheel independent suspension; adjustable upper links with turnbuckle tie-rods; nickel-plated, oil-filled shocks; a front end with adjustable kick-up; and a belt-drive, ball-differential transmission. The powerplant is an Irvine .15 Speed engine with a centrifugal clutch, an onboard ignition system, a pull-starter and a muffler that was specially made to fit the Nitro 10. On the back of the chassis, where you'd usually find the motor, there's a molded compartment that houses the 5-cell AA Ni-Cd receiver battery pack and the cell that's used to power the ignition system.



PHOTOS BY STEVE POND

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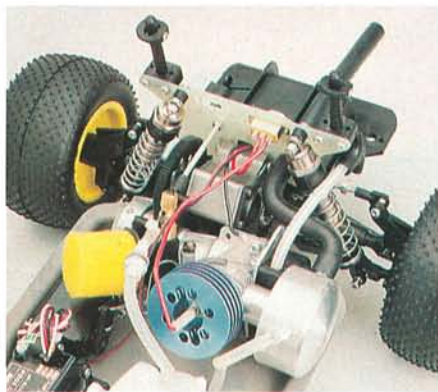
by JOHN HUBER

S C H U M A C H E R

NITRO 10

NITRO 10

The transmission and the engine come assembled and installed. Although this relieves you of a lion's share of the assembly, I found that the transmission needed a touchup. It operated smoothly, but the ball differential had been overtightened and felt very "gritty." Being a performance buff, I insist that my differentials run as smoothly as possible; a diff that's too tight can cause dents in the rings and flat spots on the diff balls. I bought extra rings and diff balls, and I rebuilt the diff to my satisfaction.



The Irvine .15 Speed engine has an onboard ignition, a pull-starter and a specially made muffler.

Complicated starter boxes and field equipment aren't necessary for all-out fun! To start the Nitro 10, you just flip the switch and yank on the pull-starter.



"The powerful Irvine .15 enables the truck to accelerate just as quickly as a truck with a modified motor...however, the Nitro 10 leaves its electric-powered brethren in the dust."

spacers between the shock tower and the bulkhead) according to the application. The Nitro 10 can have a maximum kick-up of 25 degrees, so you don't need spacers.

● **Rear suspension.** Although all of its parts fit well, you should make one

eventually, they'll break. To solve this, I installed the female halves in the transmission and the male halves in the outdrives. With this setup and the drive shaft's natural downward angle, the dirt simply falls out.

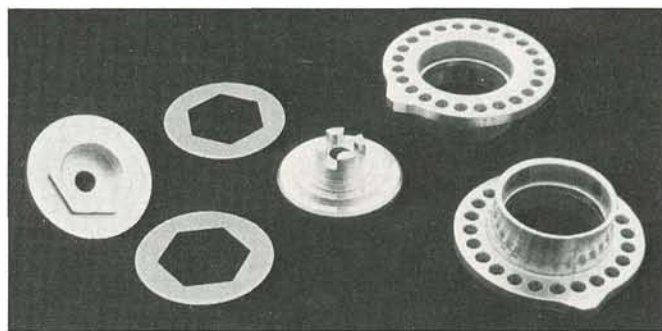
● **Shock absorbers.** Although they're similar to those used in most Schumacher cars, subtle design changes have been made so that they operate more smoothly and reliably. To prevent the shock bodies and the pistons from wearing excessively, the bodies are nickel-plated, which enables the shocks to operate more consistently over the long haul. Each shock cap has a flat spot machined into it to provide

a seat for the pressure gaskets that are inside the shocks. Without the flat spot, the pressure gasket can pop loose and "bunch up" in the top of the shock, and when this happens, you must rebuild the shock.

As recommended, I filled the shocks with 20WT oil—specifically,



A small box at the rear of the truck holds the Ni-Cds. Five of them power the radio; the sixth powers the onboard ignition.



Some of the modifications you can make include adding machined, eccentric bearing holders (right) and aluminum diff halves (left). Both increase the truck's reliability.

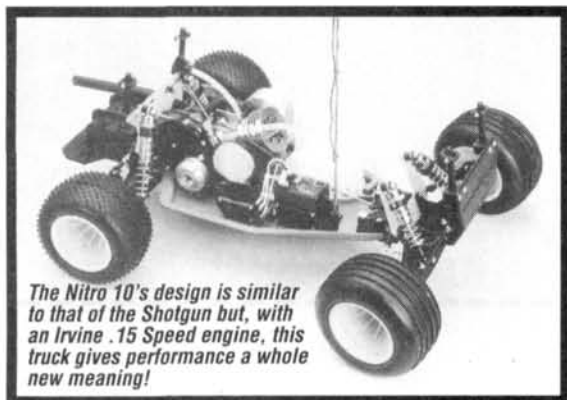
GET IT TOGETHER

● **Front suspension and the steering system.** Although they're both rather easy to assemble, pay attention to the degree of kick-up in the suspension after you've attached the front bulkhead to the chassis. You can use this chassis on several Schumacher vehicles—the Shotgun truck, the Cougar (an off-road car) and the 190 Evolution and 911 Sport on-road cars—and you must vary the degree of kick-up (in 5-degree increments using

change to prevent premature wear. The male halves of the splined universal-joint drive shafts are already installed in the transmission, but you have to install the female halves on the outdrives.

When the finished truck is sitting properly, its drive shafts are angled downward. In this configuration, dirt can build up and work its way down into the drive shaft's female halves. If enough dirt builds up, the drive shafts can bind and,

Associated's* Silicone oil, which provides the most consistent damping over a broad temperature range. The installation of the shock-shaft spacers, both inside and outside the shocks, is outlined in the instructions, but pay attention to the small footnote warning that *the spacers are only supposed to be used on the on-road cars*. Don't use them on the truck, or it will have much less suspension travel than you expected.



The Nitro 10's design is similar to that of the Shotgun but, with an Irvine .15 Speed engine, this truck gives performance a whole new meaning!

To finish the suspension assembly, you simply attach the shocks to the suspension arms. The instruction's next steps outline how to install the radio system, the fuel tank and the onboard ignition system.

● **Radio/onboard ignition.** The onboard ignition system requires a lot of soldering, and the instructions only provide sketchy details on the radio installation. You often have to read between the lines, and this makes assembly difficult for less experienced builders. Those with experience, however, should be able to complete the truck without much trouble.

● **The body.** I was fortunate enough to have a painted Parma* body on hand (the same as the one that comes in the kit), and this relieved me of the painting duties. I applied some decals and was off to the track.

FUEL FOR THE FIRE!

Armed only with some O'Donnell Racing* 20-percent-nitro fuel (highly recommended) and a few wrenches, I headed for the track. This was quite different from handling the hundreds of pounds of tools, batteries, battery chargers and other accessories that I usually have to pack for electric-powered racing!

Fuel-powered cars usually require starters and glow-plug igniters, but the Nitro 10's pull-starter and onboard ignition system make starting easy; just flip the switch and pull the starter cord! The factory settings on the carburetor's low- and high-end air/fuel mixture screws worked well for the Nitro 10's first run. The low-end adjustment is on the bottom of the carburetor, so it can't be easily knocked out of adjustment during shipping and handling. The high-speed mixture screw, however, is more exposed, so check it before you start the engine.

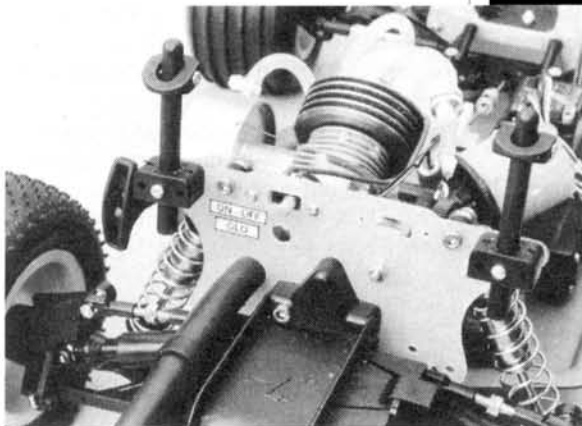
To break-in the engine, I found that turning the mixture screw counterclock-

wise, twice, from the closed position is good. (The actual setting will depend on the air temperature, so use this only as a guide.) To fill the tank, I used my mother's turkey baster as a fuel bottle (don't try this at home—big problem with Mom!). After a few pulls on the starter to draw fuel from the tank to the carburetor, the

engine fired-up quickly. To ensure its longevity, I let it idle-up to temperature (you have to "blip" the throttle to keep the engine from loading up and stalling).

When the engine had warmed up, I ran the truck around the track's empty parking lot. To break-in the engine smoothly, I ran it at no more than half throttle with a very rich setting (i.e., it sputtered slightly owing to excessive fuel in the air/fuel mixture). After I had run a few tanks of fuel through the engine, it was time to lean it out and give it hell!

Before I ran the truck on the track, I cleaned the air filter and then coated it with some 10WT shock oil. You should always oil the filter to prevent small dirt particles from passing through it and damaging the engine.



Like the Shotgun, the Nitro 10's rear end has oil-filled, coil-over shocks, a belt-drive tranny and a ball diff.

GAS BLASTER!

Now, I could tell you till I'm blue in the face just how fast this well-mannered truck is, but it's really something you have to see for yourself!

Compared with electric-powered rac-

(Continued on page 102)

SPECIFICATIONS

Type Glow-powered truck
Scale 1/10
Price \$619.95

DIMENSIONS:

Overall Length 17.75 inches
Width 12.125 inches
Wheelbase 11.25 inches
Front Track 9.75 inches
Rear Track 9.875 inches

WEIGHT:

Gross 4 pounds, 1.91 ounces

BODY:

Type Racing truck
Material Polycarbonate

CHASSIS:

Type Pan
Material Aluminum

DRIVE TRAIN:

Primary Spur/pinion
Transmission Belt
Differential Ball
Bearings/Bushings Ball bearings/bushings

SUSPENSION:

Type (f/r) Single A-arm with upper control link
Damping (f/r) Oil-filled, coil-over shocks

WHEELS:

Type (f/r) One-piece nylon
Dimensions (DxW) (f/r) 2.2x2 inches

TIRES:

Front Vee-2
Rear Vee-4

POWER:

Engine Irvine .15 Speed with pull-starter
Battery Six AA Ni-Cd cells (5 for receiver, 1 for ignition)

OPTIONS AS TESTED:

Futaba* PCM radio, 9301 and 132SH servos; Team Losi ribbed front tires and mini-pin spike rear tires; Schumacher aluminum tranny housing and Pro Diff with hardened rings and tungsten-carbide diff balls; and Hayes* fuel filter.

COMMENTS:

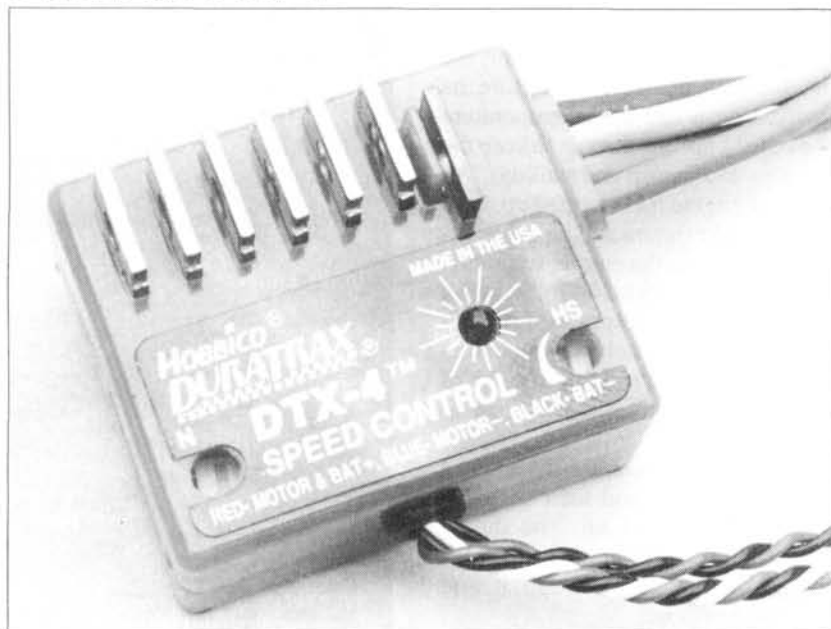
Based on the popular Shotgun electric-powered race truck, the 1/10-scale nitro-powered Nitro 10 is well-mannered and fast! Although it has a rather large price tag and its instructions may be difficult for novice builders to follow, for a "bona fide blast," the Nitro 10 is at the head of its class!

* not included

SCOPING OUT

by JOHN RIST

DuraTrax DTX-4



I'VE BEEN writing this column for about 2½ years, and I was quite surprised when I realized that I hadn't "scoped-out" Hobbico's* budget-priced DuraTrax DTX-4, which has been around for quite some time.

At first glance, it looks like a well-built, fairly strong, forward-only with brake (no reverse), racing-style electronic speed controller (ESC). The DTX-4's lack of reverse may not appeal to backyard buggy drivers, but without it, performance really skyrockets. If your favorite ride has burned up its mechanical SC, you can improve its performance and make set-up easier by swapping to an ESC such as the DTX-4. (Mechanical controllers usually have reverse, but they're hard to set up and prone to failure.) Though the DTX-4 lacks reverse, it seems to be the low-price leader for hot ESCs. A quick inspection of everything that came in the package revealed an ESC with these features:

- seven FETs (six for forward; one for brake)

- Tempfet automatic thermal protection
- ability to handle six to 10 cells
- partially sealed case that should keep out some of the dirt
- installed Tamiya-style battery connectors and bullet-style motor connectors
- built-in pulse checker

The DTX-4 comes with an instruction sheet, heat sinks, motor-noise filter capacitors (three small; one large), hole plugs (to plug adjustment holes), a screwdriver and double-sided mounting tape.

TIGHT 'N' CONVENTIONAL

The outside looks great, but it's the innards that count, so I removed the four screws from the bottom and took a look inside. I found good solder joints and conventional components packed in fairly tightly. One nice feature is the size of the adjustment potentiometers, which are rather large, so it should be easy to insert a screwdriver and make adjustments. The instruction sheet flaunts the fact that this ESC was designed and

manufactured in the USA.

The next step is a trip to the "Scoping Out" lab. To make sure that I operate an SC properly, I always read the instructions, and for a one-page affair, the DTX-4's instruction sheet is fairly complete. I would have preferred a drawing showing it connected to the other components in a car; however, with a full set of factory-installed connectors, most builders should be able to install the DTX-4 by following the instructions provided.

Pay particularly close attention to Step 5: "Speed Control Adjustments," because you might find the DTX-4's LED on/off action a little unusual. For in-

• THE SCOPING OUT LAB •

John Rist's lab consists of:

- an oscilloscope
- a digital voltmeter
- a resistor load bank
- a 6V 30A electricity supply
- a Pit Stop Radio servo/speed controller tester.

The oscilloscope is used to monitor the controller's output and to guarantee that it's fully on.

The digital voltmeter takes all the voltage-drop readings and verifies the reading on the current meter.

The resistor load bank consists of 40, 12-ohm, 5W power resistors, which can be switched on and off one at a time to vary the load between .6 amp and 20 amps, but the standard 12 amps are usually used.

In series with the resistors is a 25A Simpson current meter and a 1-percent .01-ohm resistor. By measuring the voltage drop across this resistor, the current-meter's reading can be double-checked. Of course, the lab power supply provides the test current.

stance, when setting neutral, the red LED comes on fully when you *hit* neutral; advancing the throttle turns the light out; it then comes on fully again when you hit full throttle.

RESISTANCE TEST

With the neutral and high-speed adjustment pots set and the heat sinks installed, I was ready to begin testing. I always test an SC's resistance first. It's almost impossible to measure resistance directly, so I measure the voltage drop across the ESC with 12 amps flowing, and then I calculate the resistance using the formula voltage (V) divided by current (I) equals resistance (R).

I measure resistance twice: first, along the full length of the motor wires and battery wires, including the connectors; second, 2 inches along the wires. The first reading gives me the ESC's total resistance as it comes from the factory; the second gives me a standard reading with which I can compare controllers.

With 12 amps of current flowing, the end-to-end voltage drop was 0.25 volt, which means a resistance of 0.02 ohm. With 12 amps still flowing, the voltage drop 2 inches along the wire was 0.09 volt—a resistance of 0.0075 ohm. This second reading came very close to the advertised resistance of 0.006 ohm. The DTX-4's 0.0075-ohm resistance is higher than those of some of the premium-price, high-frequency ESCs on the market today, but it's considerably lower than those of most reversing ESCs that I've measured.

LET-IT-COOK TEST

The next test is designed to see whether the controller can stand repeated battery-pack dumps without burning up. As it turns out, a 1500mAh battery pack will deliver 20 amps for 4 minutes. With this in mind, I set the current level to 20 amps and ran the test for 15 min-

(Continued on page 58)

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utes. This is the equivalent of dumping four battery packs without any cool-down periods between them. I ran this test with the heat sinks in place, but I didn't provide any cooling air from a fan. After 15 minutes, the heat sinks were very hot, but the controller was still operating normally.

DEAD-SHORT TEST

For the dead-short test, I put a short across the motor leads. If you short its leads together, a Ni-Cd battery pack can deliver as much as 100 amps. Some of my past tests involved a true dead short across a Ni-Cd battery pack—always with the same results: smoke, burned battery covering and destroyed cells.

Most malfunctions, e.g., a jammed gear or a fried motor, don't approach a *true* dead short, so my use of 44 amps seems reasonable.

I put a short across the DTX-4's motor leads, and the current jumped to 44 amps, which is the limit of my power supply. I left the short in place for 1 minute, and the heat sinks were too hot to touch without getting burned, but when I removed the short, the controller was operating normally. As well as being able to handle a lot of current, the DTX-4 has an automatic-thermal-shutdown circuit called a "Tempfet." If the DTX-4 overheats, the Tempfet activates and stops the motor current.

Caution: to make sure that the heat is distributed to the Tempfet so that it can

DURATRAX DTX-4

DIMENSIONS:

Height	0.75 inch
Width	1.33 inches
Length	1.68 inches
Weight with wires	1.74 ounces

TUNING:

Access to controls	Excellent
Ease of adjustment	Good

PRICE:

Suggested retail	\$99.95
Warranty	120 days

ELECTRICAL:

(Manufacturer's specs)

Max. voltage	12 volts (10 cells)
--------------	---------------------

Min. voltage	7.2 volts (6 cells)
Max. current	n/a
Continuous current	52 amps
Resistance	0.006 ohm

TEST PARAMETERS:

Voltage	12 volts
Current	12 amps
Voltage drop, full length of wires	0.25 volt
Voltage drop at 2-inch point	0.09 volt
Resistance, full length of wires*	0.020 ohm
Resistance, 2-inch wire point*	0.0075 ohm
BEC Voltage, 6-cell pack	5.98 volts
*Voltage Drop / Current = Resistance	

COMMENTS:

This is a really good, entry-level, racing-style speed controller. The DTX-4 carries a bargain-basement price tag, but it seems to be constructed as well as the big-name controllers. It's manufactured in the USA, too (always a plus in my book). I did experience some overheating with the FETs, but this isn't unusual in a controller in this price range. Its performance isn't as hot as those of some of the premium-price controllers, but it's a lot stronger than those of most of the reversing controllers I've tested. The DTX-4 was a snap to install and set up. Its pulse-checking LED is one of the most accurate I've ever seen. With the supplied heat sink installed, this controller should work well in almost any single-motor buggy, car, or truck that's geared to dump in the 4- to 5-minute range. The DTX-4 gets my vote as a truly cheap trick.

do its job, it's very important to install a heat sink on a Tempfet-style SC. As I've said many times before, when your car is running strangely or slowly, *shut it down and find out what the problem is*. If you keep pushing a sick buggy, you might destroy some very expensive parts.

Testing is fun, but the real fun comes from "thundering" a car over asphalt. I chose my Kyosho Sideways as the test bed for the DTX-4 because it runs almost as well on pavement as it does on grass. Its larger-than-usual tires permit it to hook up to almost any surface.

...GET SET...

I re-read the instruction sheet to find the proper settings for my Futaba Magnum Junior, and installation took only 10 min-

utes. This ease of installation was made possible by the factory-installed motor and battery connectors. I keep a couple of battery packs equipped with Tamiya-style connectors for testing sport-model ESCs that come with this type of connector installed. If you look at the test results, however, it's obvious that you can improve this ESC's performance by shortening the wires and replacing the connectors with Litespeed* connectors. When I'm racing and need maximum performance, I hard-wire the motor and use Litespeed connectors for the battery.

Caution: the instruction sheet is full of warnings that the warranty will be void if you accidentally reverse-wire the controller while

swapping connectors. If you aren't handy with a soldering iron, it's best to leave the controller in its stock condition. If you aren't involved in serious racing, I doubt that you'll be able to see much difference. Serious racers will be quick to point out that every detail matters, but for backyard jamming, maximum fun comes from keeping it simple, reliable and cheap.

...GO!

With several battery packs fully charged, I headed for my company's parking lot. (Honest folks; I do have a real job. I race cars and write "Scoping Out" just for the fun of it.) I often take a car to work with the intention of having fun during my lunch hour. Sporting a B&R Bullet stock

(Continued on page 137)

TROUBLESHOOTING

by STEVE POND

Illustrations by GERRY YARRISH

TOTALLY NUCLEAR, DUDE!

During a week of trying to get my new Team Losi Junior T to work correctly, I've gone through three differential gears. I use a Losi diff (part no. A-3005), a Speedworks 350 motor, Team Associated/Reedy 7.2V 1200mAh SCR batteries and a Futaba FP-2PB transmitter, MC112B speed controller with reverse, FP R-102JE receiver and FP-S148 servo. After a couple of

runs, the differential experiences a total nuclear "melt-together," and then it won't turn at all!

I've followed every step to the letter and tightened the diff. No one can tell me what causes this problem. Is my motor too powerful? Is it the controller? Are there aluminum diffs that will work? Please help!

Jeff Chabotte
Baltic, CT

There's no doubt in my mind that the diff is slipping, and this has caused problems with the transmission. It's the only way that the main gear could be exposed to enough heat to melt it.

You mention that you use a controller with reverse. When you switch from forward to re-

verse rapidly, it puts a lot of stress on the diff, and this can result in slippage—eventually, even a meltdown. Doing wheelies may look cool, but they aren't what your truck is made for.

There also could be a problem with the thrust-bearing assembly, which is an integral part of your diff. If the nylon locking nut that holds the diff-adjustment screw in place has worn and doesn't grip the screw firmly, the diff will loosen and—you guessed it—melt-down! In addition, if the washers and balls in this assembly have severely deteriorated, there will be excessive drag in the thrust assembly, and this will cause the diff to loosen, and well...you get the picture.

On high-traction surfaces, when it's properly adjusted, the differential should slip for only about 1 foot (if at all). If it slips any more than this, you could be headed for trouble.



DON'T ALLOW YOUR CAR TO PLOW!

I own an Associated RC10 that I run on an indoor on-road oval. Whenever it turns, the front end plows into the wall. I've tried new tires, but it still does this. I use an Associated stock motor (the one that came with the kit), a 108 servo and an Airtronics VT2P AM radio. How can I solve my problem?

Andrew Zeigler
Indianapolis, IN

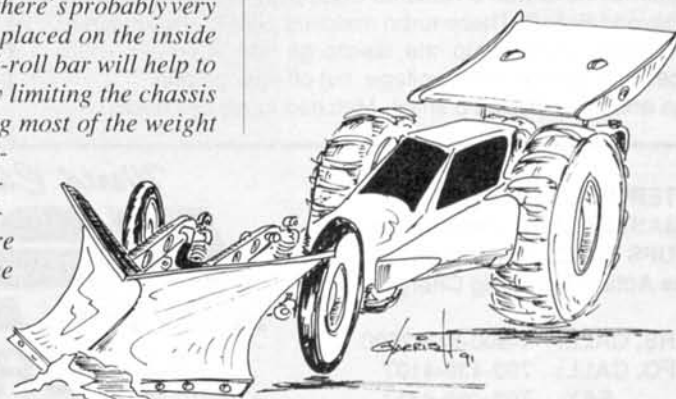
There are several things you can adjust on the car to improve its steering capabilities, but without knowing how you've set the car up, it's difficult to pinpoint the cause of the problem.

Be sure to use 5-degree caster blocks on the front suspension. The kit comes with 15-degree caster blocks, which are fine for off-road racing, but for

carpet racing, reduce the caster angle to improve steering.

Heavy shock oil (no, not 140WT; try 50WT or 60WT) will improve the overall handling of your car. Also, try using anti-roll bars. When your car goes through the turns, there's probably very little load (if any) placed on the inside front tire. The anti-roll bar will help to balance the car by limiting the chassis roll and preventing most of the weight from being transferred to the outside wheels. The diameter of the wire that you use for the anti-roll bar will also affect how well the car will handle.

When the handling is in the ballpark, you can fine-tune it by experimenting with spring tension. To increase the front-end steering response, loosen the front springs slightly (tightening the rear springs will have the same effect).



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COLUMNS

Nitro News
Scoping Out
Troubleshooting
Truck Stop

DON'T TREAD ON ME!

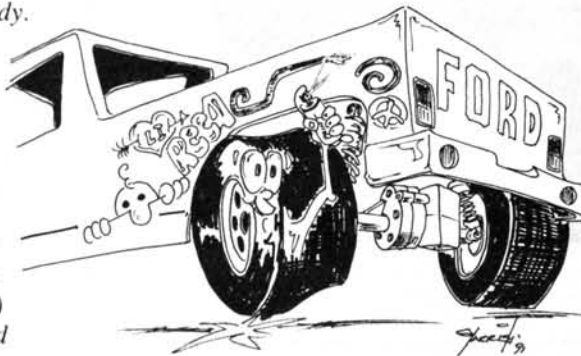
I recently got tire marks on my car's Lexan body. How do I remove them without destroying it?

Keith Fudalik
Canandaigua, NY

You should be able to remove the marks without damaging the body.

I've found that some brands of tire-traction compound, e.g., Racer's Choice TQ8+, remove them very well. (The marks are traces of rubber left by tires that have rubbed against the car, and traction compound is formulated to soften rubber.) You could also try Richard

Muise's special paint-overspray remover—3 parts nail-polish remover and 1 part rubbing alcohol. Which ever you choose, be sure to test it on a scrap piece of Lexan to make sure that it won't damage your car body.



RIGHT-TURN-ONLY CLOD?

I don't know much about R/C cars or trucks. I own a USA-1 and a Clod Buster, and I use a Futaba 2PBKA with S148 servos. It works fine with the USA-1, but not with the Clod Buster. The truck turns right well, but when I try to turn it to the left, it moves very little. I didn't build these trucks, but I was told to use an S9302 servo in the Clod. Will this servo work with the 2PBKA and, if so, will it fit in the same place as the S148 servo?

Calvin Ziegler
South Gate, CA

Before you spend any money on new servos, you should check a few things



to determine exactly what the problem is. First, to prevent the truck from "jumping" off the table if you accidentally hit the trigger while you're checking things out, disconnect the motors from the speed controller. Unplug the steering servo and plug in a n o t h e r (maybe you could borrow one from a friend). If the new servo operates well in both directions, then you have to replace the servo you were using or have it serviced. If the new servo acts in the same way, though, the problem might be in the radio. Also, disconnect the steering linkage from the servo and try it again. Something in the steering hardware may be binding.

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About two months ago, I bought a B&R Bullet 27-turn stock motor for my Ultima II. I was impressed with the speed that it provided, but after two runs, I noticed an unusually high temperature. At first, I thought this was normal, but when I ran the car at a local track two days later, the motor became so hot that it burned the lead wires off my SCR battery! I replaced the motor after this, and the car ran well.

I use a Novak T-4 ESC and the original 32-pitch stock gearbox, and I clean the motor after every run. What's causing this problem? Can I solve it without replacing the motor?

Eric Peterson
Bremerton, WA

The Bullet motor has a high degree of timing (40+ degrees), so it naturally becomes hot. You mentioned that the leads came off the battery, and this leads me (pun intended) to believe the problem is in the battery pack.

Sometimes, when the cells in Ni-Cd packs are overcharged, over-discharged, or simply worn out, they vent (i.e., gases from inside them escape through safety vents on their positive ends). When this happens, the cells become extremely hot—yes, even hot enough to melt solder. A vented battery will still take a charge and provide the car with power, but run times will be noticeably shorter.

If you have a technical problem that your hobby shop or racing friends can't resolve, give us a shout at Radio Control Car Action, and we'll see if we can chase down an answer for you. Questions should be of a technical nature and should be addressed to Troubleshooting, c/o Radio Control Car Action, 251 Danbury Rd., Wilton, CT 06897.

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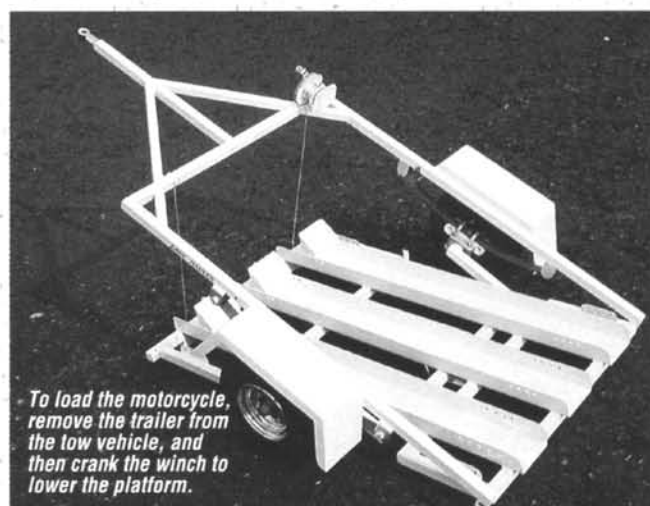
Small bungee cords secure the cycle to the trailer for highway haulin'. Although there's only one bike on the trailer, it can carry two using the outer racks.

THIS MONTH'S Home-Built Project comes from Stephen Mueller of San Leandro, CA. After he finished building a trailer for his R/C boat, he wanted another challenge. He decided to build a trailer for his Kyosho motorcycles, too.

Stephen needed plans for a full-size motorcycle trailer and, not knowing where to get them, he asked a friend who had six or seven cycles for help. His friend came up with the name of a Texan company that makes trailers: G.C. Mfg. Inc. Stephen made a quick call to the company, and they sent him a brochure. He decided on a trailer called the "Easy Hauler II," which is designed for one or two "fully dressed" motorcycles. He carefully scrutinized the brochure and then headed for the hobby shop.

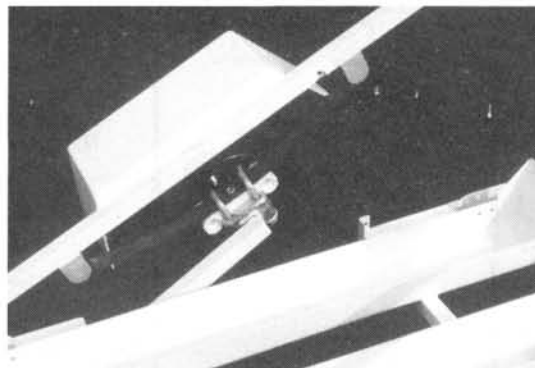
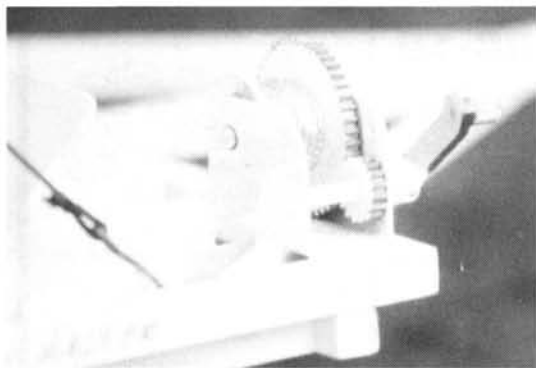
Easy Hauler

by JOHN HUBER



To load the motorcycle, remove the trailer from the tow vehicle, and then crank the winch to lower the platform.

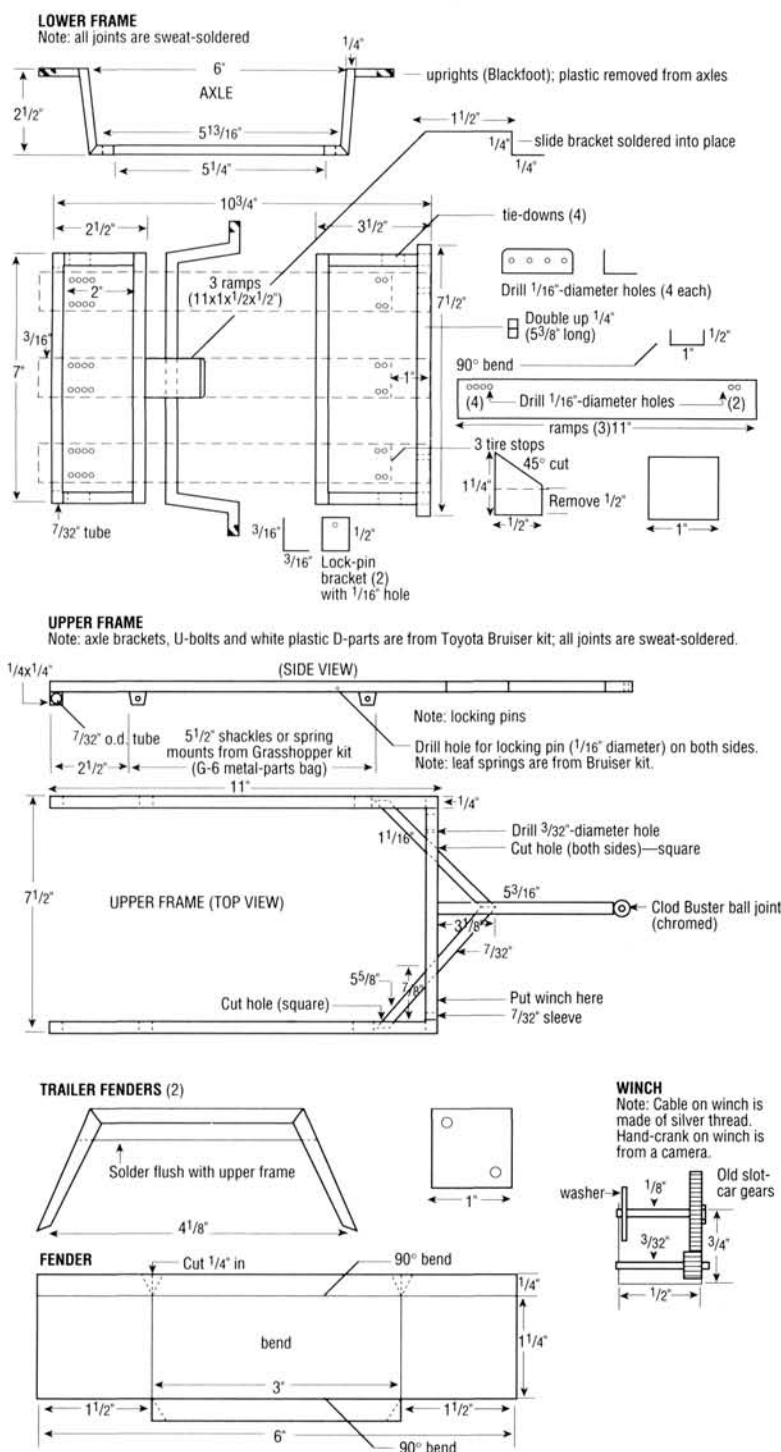
PHOTOS BY JOHN HUBER



Easy Hauler

You use this tiny winch to raise and lower the platform. The gears are from a slot car, and the crank is from an old camera.

The suspension is handled by the Bruiser leaf springs.



QUITE A HAUL

With some K&S* brass tube and a few spare Tamiya* parts, Stephen began to create the trailer. After a week of long nights of cutting and soldering parts in his cellar, he emerged with the miniature Easy Hauler II. Its suspension consists of parts from Tamiya's Bruiser and Grasshopper models, and its wheels are from the Frog. He removed the plastic ends from Blackfoot uprights and used the uprights to support the wheels.

The trailer's best feature is its functional platform, which works just like that of the full-size trailer. To load and unload cargo, you lower and raise the platform using a hand-cranked winch. To make such a small system, Stephen used old slot-car gears and a rewind arm from an old camera. Braided wire was too stiff to use for the cable, so Stephen used silver thread. It wasn't as strong as he wanted it to be, but it still worked better than wire. When he puts the trailer into its "mobile" mode, two small pins hold the frames together.

Thanks to Stephen for sending us his trailer so that we can share it with the rest of the world. I'm sure it will spark the imaginations of many readers.

*Here are the addresses of the companies mentioned in this article:

K&S Engineering, 6917 W. 59th St., Chicago, IL 60638.
MRC/Tamiya, 200 Carter Dr., Edison, NJ 08817.

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- 4 U-bolts
- 8 nuts
- leaf springs

Blackfoot

- Uprights

Frog

- Wheels

Grasshopper

- G-6 metal parts bag

Other parts

- Slot-car gears
- Camera-rewind arm
- Silver thread

How To Build & Adjust Ball Diffs

by FRANK MASI

AREN'T YOU TIRED of hearing about how crucial differentials are to the performance of your R/C cars, and how minute adjustments can make or break your day at the races? Well, I'm as tired of saying these things as you are of hearing them, but not everyone who reads this magazine is an expert on ball diffs. In fact, there's a general lack of knowledge among some less-experienced R/C enthusiasts out there. That's where this article comes into the picture. I'll try to cover two important areas: how to build a ball differential and how to adjust it properly.

DIFF PARTS

The important thing here is that all types of ball diff, whether they're used on off-road cars or pan cars, are basically the same. Here's a quick recap of a ball diff's components. First, there's the main ball race, which can have many appearances: it may be a spur gear, such as those used on on-road, direct-drive cars; it may be a belt pulley, such as those used on 4WD off-road cars; or it may be a specific gear in a transmission. However it looks, its job is to house the main set of balls that provide the primary differential function: allowing the inside wheel of a cornering car to rotate at a slower speed than its outside counterpart (or, for argument's sake, allowing the outside wheel to rotate faster than the one inside). This function is essential to proper handling. Without a diff, one of your car's wheels will

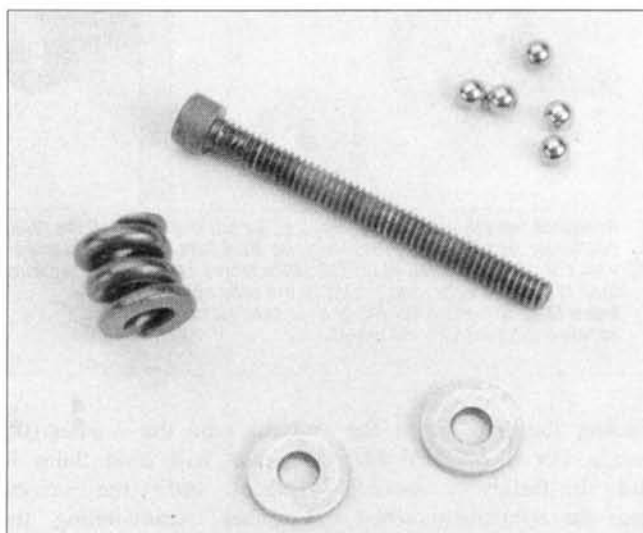
always skid whenever your car takes a corner.

Pressure plates are also important parts of ball diffs. They're the two parts that "sandwich" the balls in the main ball race. The amount of pressure that these plates

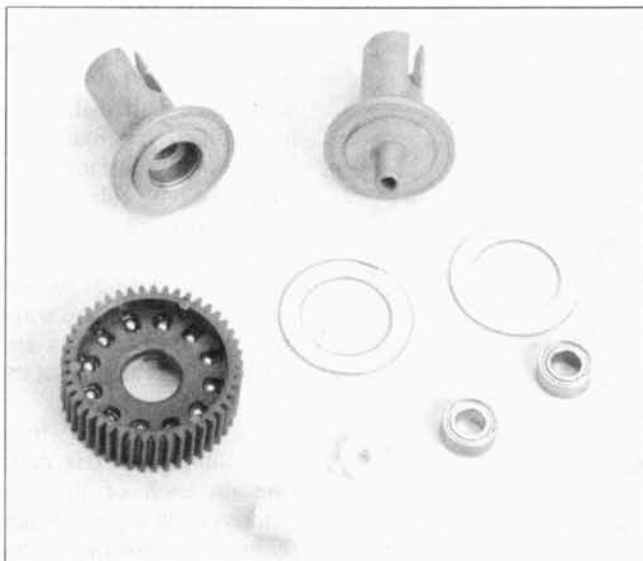
apply to the main diff balls directly affects the amount of friction at which your diff operates and, for that matter, how much the diff will "de-clutch" or slip. The plates are fastened to each other by an adjustment bolt

or screw that runs through one plate, through the main ball race and into the other plate. By adjusting the screw, you can alter the amount of pressure that the plates exert on the main diff balls.

Making The "DIFF"erence



It's good to make sure that you have all of the necessary bits and pieces before you begin diff assembly. Be careful with the tiny thrust-bearing balls and washers; they're easy to lose.



TANK TREADS?

To describe how ball diffs operate, let's use a tank tread as an example. ("A tank tread?" you say?—"Hogwash!" Indulge me.) Watch a tank or bulldozer in action. When the tread is moving, its top travels toward the front of the tank; its bottom moves in the opposite direction. Now imagine that the top of the tread is one diff pressure plate; the bottom of it is the other, and the bogie, i.e., the wheel inside the tank tread, is the diff ball. When a pressure plate moves in one direction, the other plate moves in the opposite direction—ta da!

Now, back to our story. The diff adjustment screw's head must be supported by some kind of bearing because the pressure plate that it's threaded into rotates in one direction, and the pressure plate that the screw head is in rotates in the opposite direction. This bearing is called the "thrust bearing," because it must carry whatever load (pressure) that's placed on the main diff balls. With all this going on, it's important to build this contraption carefully.

DIFF ASSEMBLY

Check that you have all the parts that make up the ball diff. A lot of them are tiny, and many's the time I've be-

BALL DIFFS

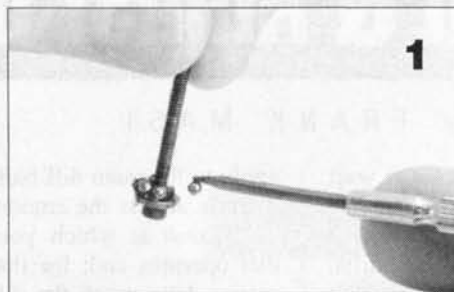
gun to build a diff only to find that the manufacturer had shorted me out of one tiny thrust-bearing ball. Take my advice: take stock before you start.

Find the main ball race (spur gear, diff gear, diff pulley—same things, different names), and press the main diff balls into their respective holes in it. Next, put a little diff lube on each ball with a small screwdriver or similar tool. Do this to both sides of the gear, and wipe off the excess with your finger (eeyuck!). Set this assembly aside.

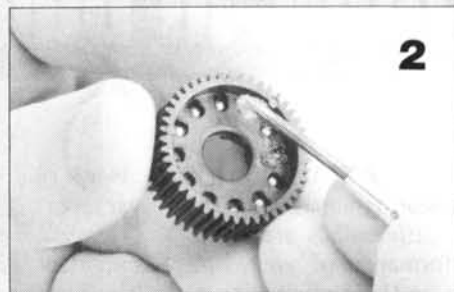
MAXIMUM THRUST

Find all the parts that will compose the thrust-bearing assembly. If you're building a diff for a pan-type car, you'll need a washer with small balls installed in its diameter; if you're building one for an off-road car, you'll need a diff adjustment screw, several Belleville (conical) washers, a pair of small, hardened washers (known as thrust-bearing washers) and the thrust-bearing balls (usually they're tiny little suckers).

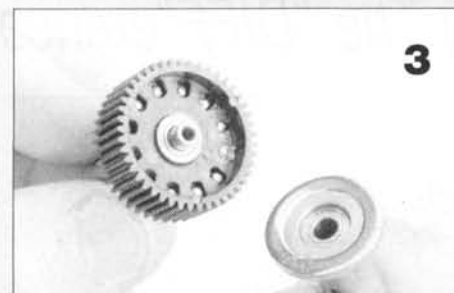
For the on-road diff, put a little molybdenum grease on a flat surface and slowly roll the thrust-bearing assembly back and forth,



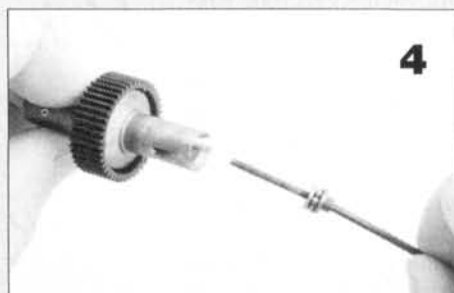
1
Assembly begins with the thrust bearing. Slide one of the washers over the adjustment screw and coat it liberally with grease. Using tweezers or a small screwdriver, carefully put the proper number of balls onto the washer. Then, add the second washer.



2
Assemble and lube the main diff gear. Install the diff balls in their respective holes and, with a small screwdriver, "pack" them each with a little high-quality diff lube. Wipe away the excess with your finger.



3
Assemble the diff outdrive halves, i.e., install any additional bearings or miscellaneous hardware your diff calls for. Next, place the diff washers on their respective hubs, and put the entire assembly together so that the main diff gear is sandwiched between the hubs and the plates.



4
Install the thrust bearing and the adjustment screw. Before making the final adjustment, you should only tighten the screw until you feel a little tension.

coating the balls with the grease. For an off-road diff, slide the Belleville washers onto the adjustment screw, followed by one of the thrust-bearing washers. Now, use a small screwdriver to cover this washer with some molybdenum grease. Using tweezers, carefully place the right number of thrust-bearing

balls onto the washer (the grease will hold them in place). Add the second washer, sandwiching the balls, and set this assembly aside.

UNDER PRESSURE

As stated before, pressure plates are the key components of a ball diff. They must touch the main diff balls, so the surface upon which the balls ride must be as flat and as smooth as possible. Most ball diffs use separate drive rings for this purpose, but there are some in which the outdrives and the drive rings are part of the hub.

It's all downhill from here. Simply put one drive ring on each of the two outdrives (on a pan-car differential, put one ring on the

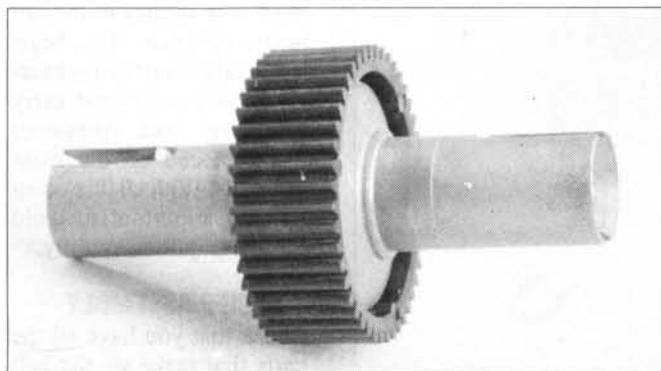
axle and the other on the diff-side wheel hub), and sandwich the main ball race between the diff halves. Finally, install the thrust-bearing assembly (this will hold the diff halves together), and tighten the adjustment screw or nut until just a little pressure is placed on the main diff balls; tighten it no further for now.

DIFF ADJUSTMENT

Once you've properly assembled the diff and adjusted its diff screw or nut so that the plates are just touching the main diff balls, you can begin to make the final adjustments.

It's important not to over-tighten the diff; this can cause the balls to de-

(Continued on page 152)



The completed diff, ready for installation. Be sure to note which side of the car the adjustment screw must face.

by JIM SHEPKA

IF YOU LIVE near a full-scale race track, or if you go to the races, then you've seen them. They're large, brightly colored and covered with sponsor decals. I'm talking about the 18-wheelers that haul race cars to the track and then back to the shop. For a long time, if you wanted to make one of these rigs for your R/C race car, you had to run to the hobby shop and get some balsa and epoxy, because nobody made a kit! McAllister Racing* has changed that with their new Fly'n "M" kit. With what's included, you can make your own race rig to carry your race car to the track in style.



THE KIT

This isn't a small package. When UPS arrived at my door, I was surprised at the size of the box. When I opened it, my fears were realized. This was going to be a big project! The rig has four major pieces, along with many smaller Lexan pieces.

There are two versions of this kit; mine was the top-of-the-line unit (with the chassis plate)—I get nothing but the best from my friends at *Car Action!* The chassis components are individually bagged and numbered for easy identification. The cab and trailer assembly are made of Lexan, and they're easy to paint and to work with.

“McALLISTER”
Fly'n
M



RIOTOUS
RIG

SPECIFICATIONS

Type 18-wheeler
 Scale 1/10
 Price \$159.95

DIMENSIONS:

Overall Length 36.75 inches
 Width 9.5 inches
 Wheelbase 32.625 inches
 Track (front/rear) 7.75 inches

WEIGHT:

Gross (with battery) 5 pounds, 6 ounces

BODY:

Type Tractor/trailer with tire rack
 Material Polycarbonate

CHASSIS:

Type Pan car
 Material Fiberglass

DRIVE TRAIN:

Primary Pinion/spur
 Transmission Direct drive
 Differential None
 Bearings/Bushings Bushings

SUSPENSION:

Front: Type Straight-axle pan-car type
 Damping Spring
 Rear: Type None

WHEELS:

Front: Type One-piece nylon
 Dimensions (DxW) 2.0x1.7 inches
 Rear: Type One-piece nylon
 Dimensions (DxW) 2.0x2.0 inches

TIRES:

Front/Rear Rubber

ELECTRICS:

Motor 540/05*
 Battery 6-cell stick pack*
 Speed Controller Not included

OPTIONS AS TESTED:

Novak T-4 ESC; Futaba servo and receiver; RAM gas/diesel sound and horn with 4-inch speaker (#38), car tail and stop light with lens (#20), pace car 10-light set (#33) and roll bar with two lights (#29); Pro-Line rims and tires.

COMMENTS:

This is a really impressive kit. With the right amount of time and effort, you can come up with a first-class concours winner. The large pieces are really easy to work with, and there's plenty of room to mount aftermarket parts. The RAM lighting and sound components really add class to the entire package.

* not included

SHELL ASSEMBLY

First, I read the instructions so that I'd have a better feel for the construction techniques. I'd never worked with Lexan of this size before, and I wasn't sure how the pieces would fit together. I trimmed the major pieces (the upper and lower cab assembly, the trailer and the tire storage rack) according to the enclosed diagram. A pair of Lexan scissors simplified the job. When the pieces had been roughed out, I set the upper cab assembly into place and checked the fit. The one-piece cab and sleeper unit is designed to fit neatly over the lower unit. Some additional trimming was required, but the fit was quite acceptable.

Then, I turned my attention to the two-piece trailer assembly. I trimmed the tire/storage rack to specs and fitted it to the flatbed. Obviously, some pretty high tolerances had been used when these pieces were molded, because this section, too, went together

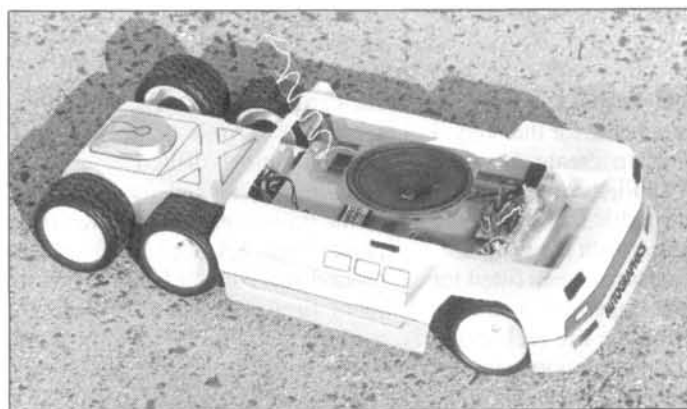
with very little fuss.

In a matter of minutes, I'd pretty much laid out the entire rig, so I decided to go ahead and mask it with a couple of coats of latex automotive mask. It's very similar to the kind you buy in hobby stores, but since I needed a lot of it, this was more cost-effective. I put it aside overnight.

CHASSIS ASSEMBLY

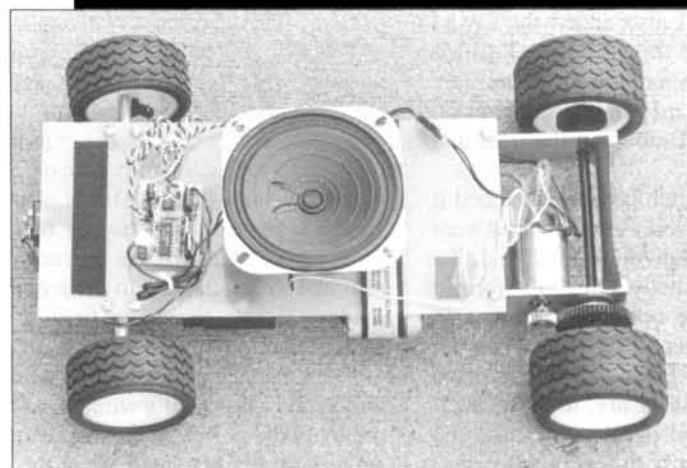
There are many ways to approach the drive-line assembly, but since I wanted an operational unit, not a static display, I began with the chassis plate's construction. You can use an existing pan-car chassis or you can buy the optional chassis plate that was designed for this unit.

No surprises here: the chassis goes together like that of any pan car. The only difference here is that you'll turn the entire chassis plate upside-down to accommodate the larger tires and facilitate the body mounting! Using the



PHOTOS BY JIM SHEPKA

Here's the rig without the cab's top attached. Velcro® holds the top of the rig securely to the bottom section.



The Fly'n "M"'s main chassis is really an upside-down pan-car chassis. You can see the RAM sound unit and the Pro-Line tires.

FLY'N "M"

enclosed hardware, I attached the motor-mount assembly to the plate. Because of the reversed chassis, the motor's polarity had to be reversed (yes, a reverse-wind motor would also work). The kit supplies a standard bar-type front suspension—no fancy T-plates or floating pods here! There's really no need for race-worthy suspension on this truck.

Since we're not going to be setting any land-speed records, the kit includes bushings for the corners instead of the more expensive bearings. A straight-locking drive assembly is also included instead of the standard pan-car ball differential. I bolted the kit-supplied standard 32-pitch spur gear directly to the drive hub. Of course, if you feel strongly against this approach, you can always upgrade to a ball diff.

It was time to find some neat tires and rims for the rig. I wanted a classic rim design with a large tread pattern to really set off the unit, so I chose Pro-Line* rims and tires. The aggressive, realistic-looking tread pattern complements the whole package.

RIG-ON-A-ROLL

I laid out the paint scheme for the body. I used Pactra* paints to create my own team colors, and I applied Autographics* decals. Painting a rig this size was really easy, and I was happy with the results.

After the body parts had been fitted for size, I mounted the upper-cab assembly to the lower half and the tire rack to the bed assembly. The instructions suggest that you do this with servo tape, but since I was going to add special effects, I opted to use Velcro®. I also added the Lexan rear axle block at this time, and I drilled out holes for the axles with a Dremel* tool. I used standard pan-car rear hubs on all corners, and I mounted the tires and the rims.

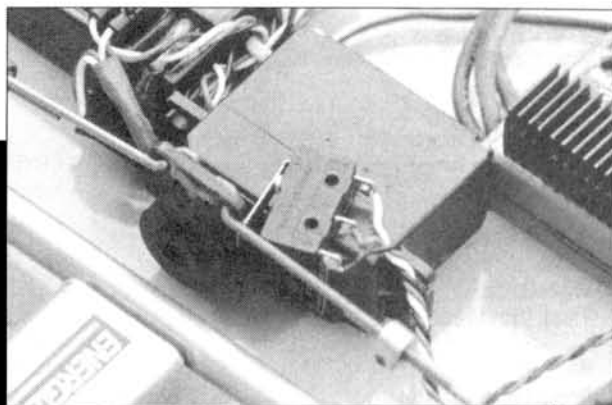
I cut out the hitch box and attached it with Velcro® as well. A bolt and nut were used for the hitch pivot, so I had to drill a small hole in the body's hitch platform. I also included the optional trailing axle carrier for the second set of tires on the tractor bed. The front axle is the drive axle; the rear one is just for effect. Of course, if you feel really ambitious, you can always power both sets of wheels!

FX

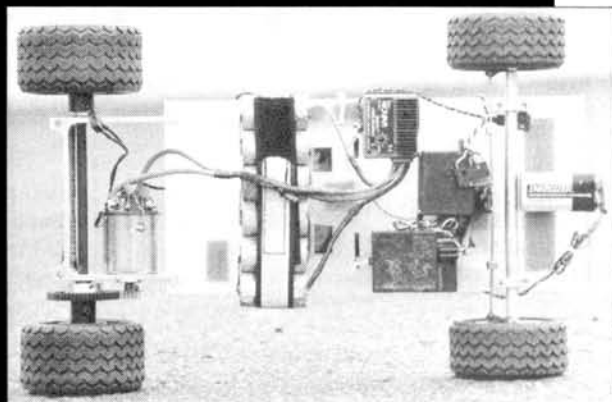
With a rolling chassis in place, it was time to mount all the hardware I had acquired for this project. RAm* products supplied me with enough bells and whistles to achieve a very realistic appearance. I began by mounting RAm's Pace Car light set. I drilled holes into the cab (the instructions include the correct diameters) for the bar flasher and six smaller flashing bulbs, then I snapped colored lens elements into place and inserted the bulbs into the lens holders. In lieu of the kit's headlight assembly, I cut the existing wires and used an externally mounted headlight unit. For the car-carrier assembly, I went with RAm's rear brake lights. I drilled holes for the lens elements into the rear of the trailer, and snapped the bulbs into place. Then, I dabbed household silicone around the edges of the lenses to keep them firmly in place. These lights are wired directly to the motor, and they put out a faint glow until the motor stops turning (this unit requires a separate power supply to operate when the motor isn't turning). The effect is *very* realistic.

What's a big rig without the sounds of diesel power? RAm came through for me again. I attached a RAm sound-effect control unit and 4-inch speaker to the top of the chassis plate, and I made all the necessary connections. This control unit, which is powered directly by the 6-cell power pack that propels the entire rig, also had to be attached to the motor, so I made a simple connector from a set of Dean* pins.

RAm also supplied a microswitch that will sound a horn if it's wired to a servo. I mounted the switch on top of the steering servo, and it's activated when the steer-



The servo activates the truck's RAm horn through a microswitch attached to the servo.



All of the radio gear is mounted to the bottom of the chassis, not the top.

ing is turned to full-lock in one direction (the servo saver makes the necessary contact at that angle to activate the switch). There are several sounds available when the three rotary switches are adjusted.

FLY'N HIGH

A standard Futaba* 132 servo and receiver were used up front. The power is controlled by a Novak* T-4 ESC and a standard 6-cell SC Sanyo* power pack. With the speaker unit attached to one side, and the chassis' electronics attached to the other, the chassis was ready for mounting—remember, it's upside-down!

The lower-cab assembly is designed to fit right on top (bottom!) of the chassis, and I mounted it using Velcro®. With all the on-board electronics, I'll need easy access, and this seemed to fit the bill. With the lower cab assembly in place, I mounted the upper cab to the side rails of the lower unit.

The project was taking shape! I

(Continued on page 175)



by FRANK MASI

ONE OF THE "pioneer" 1/10-scale on-road cars was produced by a little-known company named Composite Craft*. It was called the Predator, and it was essentially "scaled-up" 1/12-scale technology. The Predator utilized a "beam" front suspension, much like the one found on the Delta Spyder, and it used a standard, rear, friction-damper pod that was connected to the main chassis with a flexible T-plate. At the time, 1/10-scale on-road racing was in its infancy. There were, however, several other cars that competed against the Predator. One was the Pro-10, made by TRC*—a company then noted more for its 1/12-scale tires than for its racing cars.



TRC/
COMPOSITE CRAFT

EliteSS



The Predator and the Pro-10 were markedly similar in appearance and performance. Neither company had the upper hand—from a technology standpoint, that is—until Composite Craft “upped the ante” with its Predator Lynx. The Lynx featured

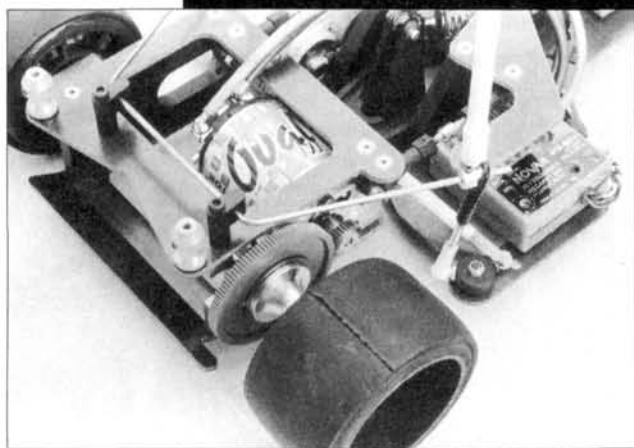
isn't one of them! The Lynx's intense specialization begins with its graphite chassis plate. All six battery slots are on the left side, and this keeps most of the car's weight on the inside wheels during cornering—a must for high-speed ovals.

tude during cornering for optimum traction.

The split-axle beam's kingpin-mounting holes are drilled to achieve approximately 2 degrees of positive camber for the inside wheel and 2 degrees of negative camber for the outside. By keeping the

stead of using a standard, flexing T-plate, the Lynx pod is completely separate, connected only by means of a pivot ball and two turnbuckle linkages. This setup allows the pod to act independently of the main chassis. Because the rear pod is free-floating, a means of controlling chassis roll and a method of setting “tweak” (i.e., the loading of the car's weight to the tires; this greatly affects handling) are needed. By using a conventional sway bar with adjustable rod ends, both these characteristics are controlled.

The Super Speedway's rear motor-block plate incorporates a kick-up of about 30 degrees to increase the car's “ground effects.” It also extends partially to protect the spur gear in the event of a rear-end crash. To damp the rear pod, all Lynx cars use an oil-filled, coil-over shock absorber; the Lynx SS, however, comes standard with TRC/Composite Craft's optional, large-volume, purple-anodized shock, which is very simi-



The Lynx's rear pod is what sets the car apart from the crowd. Its full-floating design is instrumental in smoothing out rough tracks. A new lower plate featuring a kicked-up rear portion (which is supposed to increase high-speed stability) is standard equipment on the Super Speedway.

a radically new rear-suspension design that used a “full-floating” rear pod. On rougher tracks, the Predator Lynx enjoyed a significant advantage over cars that used more conventional technology, because its floating rear pod isolated the chassis from shock more efficiently.

Instead of competing, TRC and Composite Craft joined forces, and the result was the Lynx II—a refined version of the original Predator Lynx.

The latest offering from this winning team is the Lynx II Elite Narrow Super Speedway. This car is made with one singular purpose—domination of the high-speed banked oval.

OVAL OPTIONS

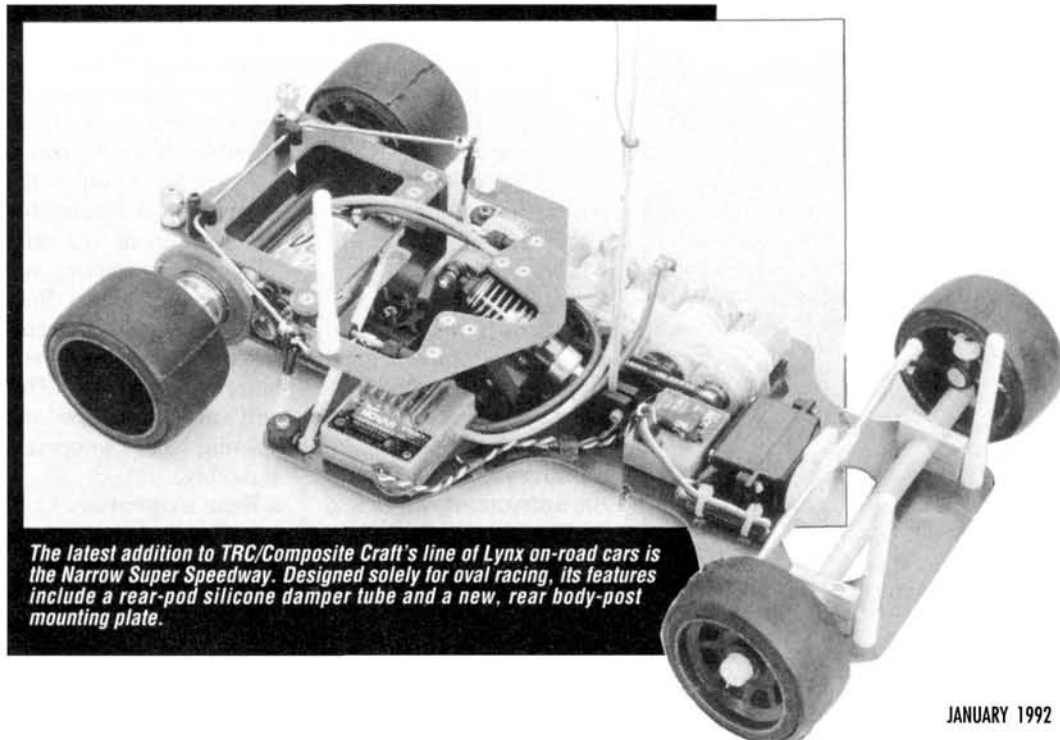
There are many 1/10-scale on-road cars that are designed to pull double duty as both on-road racers and oval racers-. The Lynx SS

Up front, the axle beam found on the standard Lynx has been replaced by a two-piece, narrow magnesium unit that allows individual caster settings for each front wheel. This adjustment allows you to accurately position the car's front-wheel atti-

wheels at the proper angle to the track, this essentially negates the effects of chassis roll when the car corners at high speeds.

MOD POD

The Lynx's three-link, full-floating pod is an engineering masterpiece. In-



The latest addition to TRC/Composite Craft's line of Lynx on-road cars is the Narrow Super Speedway. Designed solely for oval racing, its features include a rear-pod silicone damper tube and a new, rear body-post mounting plate.

TRC/COMPOSITE CRAFT

LYNX II SS

Type On road
Scale 1/10
Sug. Retail Price \$349.95

DIMENSIONS:

Overall Length 19 inches
Width 8 inches
Wheelbase 10.5 inches
Front Track 6.75 inches
Rear Track 6.5 inches

WEIGHT:

Gross (w/battery) 2 pounds,
11.12 ounces

BODY:

Type NASCAR
Material Polycarbonate

CHASSIS:

Type Pan
Material Graphite

DRIVE TRAIN:

Primary Pinion/spur
Transmission Direct drive
Differential(s) Ball
Bearings/Bushings Ball bearings

SUSPENSION:

Front: Type Floating kingpin
Damping Coil-spring
Rear: Type Full-floating rear pod
Damping Oil-filled coil-over shock

WHEELS:

Type (f/r) Composite
NASCAR style
Dimensions (DxW) (f/r) 1.75x1 inches

TIRES:

Front/Rear Staggered radials

ELECTRICS:

Motor, Battery,
Speed Controller Not included

OPTIONS AS TESTED:

Novak 410-MXc, Novak NER-2X, Futaba S132H servo, KO Propo EX-1 transmitter, Trinity Oval Man motor, Magic Motorsports 64-pitch spur gear, Du-Mor R/C Star-Force 64-pitch pinon, PT Matched SCE's, Kimbrough large servo saver.

COMMENTS:

This is a very well-engineered car. It may be over-engineered (if that's possible!). Nonetheless, there's nothing like a Lynx for smoothing out tracks that are less than perfectly flat. The overall quality of the parts is high, and the car "builds" well. I'd like to see a little of TRC/Composite Craft's engineering prowess go toward the front end instead of just the rear.

lar to the type found on off-road cars.

Lastly, the Lynx SS kit includes a full set of trick T/M Radial Stagger tires. These gold-compound radials are designed so that the inside pair is of a smaller diameter than the outside pair; this is supposed to aid the car in high-speed turns. (I told you that this was a specialized car!)

BUILDING THE PERFECT LYNX

One of the major appeals of pan-car racing is that the cars can be built quickly and easily. I'd like to say that the Lynx falls into this category, but because of the complexity of its rear pod, it takes a little more time and precision to construct it.

The instructions for building the Lynx SS consist of two booklets—one pictorial and the other corresponding text—and a supplemental instruction sheet that covers the additional components and the assembly techniques involved only in the construction of the SS.

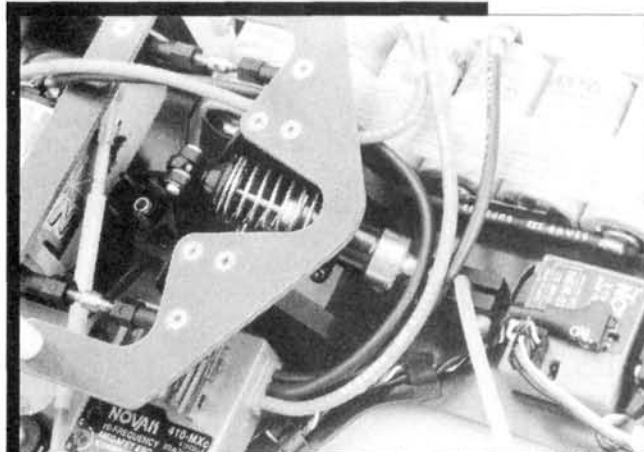
Of key importance: when you build the Lynx SS, take your time and do it right. It will pay off when you take to the track! Many R/C enthusiasts tend to breeze through the seemingly unimportant steps, but most often, these steps are where that little increase in performance may be achieved.

● **Battery slots.** Early on in the instructions, we're told to file the chassis battery slots. It's advisable to do this first, as it's next to impossible to accomplish once the suspension com-

ponents have been assembled and attached. I've found that the easiest method of beveling these slots is to find a large file or a flat piece of material and attach a piece of medium-grit sandpaper to it. You'll find that the sandpaper cuts the graphite much faster than normal file teeth would,

main chassis, pay attention to the correct positioning of the linkage ends. To ensure that you'll be able to adjust them later (when they become loose from normal wear), they must face the proper direction.

As mentioned earlier, the Lynx SS comes standard with TRC/Composite Craft's Pro Shock kit. This



Previously, TRC/Composite Craft offered its Pro Shock kit only as an option to replace the smaller aluminum damper found on the Lynx; it's standard equipment on the Lynx Super Speedway.

and it does a neater job to boot.

● **Front suspension.** The next areas of attention are the kingpins and the steering blocks. It's imperative that the blocks move on the kingpins as freely as possible. If yours feel a little tight, remove the kingpins from the crossbar and place them in a drill. While they're rotating, run them against a very fine-grit sandpaper or fine emery cloth to remove any burrs or irregularities. This will usually allow the steering blocks to operate smoothly.

● **Rear suspension.** Construction from this point is simple and straightforward, but when you assemble the tie rods that connect the rear pod to the

unit is vastly superior to the small-capacity shock found on the other Lynx models, and care should be exercised during its assembly. Use the shock piston with two notches, as it will yield lighter damping than the single-notch piston (provided you're using the same weight of shock oil in both instances). According to Andy Dobson's section on set-up (found in the instructions' supplement), 20- to 25WT shock oil is good to start with, and the silver spring (included) should be used initially.

Another of the Lynx SS's unique features is its rear damper tube, which provides lateral (side-to-side) damping that keeps the rear pod from "chatter-

ing" on the corners. I found the instructions to be a little too sketchy about its proper placement; the only reference made to the damper tube is in the non-pictorial instruction supplement sheet. When properly installed, one end of the damper tube should be attached to the ball end under the rear pod's upper plate, and the other end should be attached to the front of the lower right sway-bar mount.

RUNNIN' GEAR

The Lynx SS is a serious piece of work, so I thought that I'd better outfit it with top-quality radio gear and electronics if I wanted it to live up to its performance potential. For starters, I chose the EX-1 transmitter from KO Propo*. This unit is the choice of many world-class drivers; it has all the necessary features and adjustments you'd expect from a top-of-the-line transmitter, e.g., steering and throttle end-point adjustments (EPA), and steering dual-rate adjustment.

Considering size and weight, I replaced the KO Propo receiver with a Novak* NER-2X micro receiver on 75MHz. To handle the turning duties, I chose one of Futaba's* popular servos—the S132H high-speed ball-bearing unit. Though it's not the strongest one around as far as torque is concerned, it's ideal here, because it's very fast and light.

Rounding out the list of radio gear is Novak's top-gun electronic speed controller, the 410-MXc. This

ESC is one of the most efficient units available, and its high-frequency switching makes it ideal for on-road racing, in which gearing and run

amount of chassis roll, but it's also crucial in determining the car's steering. Because of its narrow roll-center, the Lynx SS needs to be run "soft," so the adjustment balls on the sway bar should usually be as close to the ends of the bar as possible. If you need to increase steering response, move them toward the rear of the car (a little at a time) to reduce rear bite and encourage the car to oversteer.

One final word on setup: it's critical that the wheelbase of the Lynx be of equal width on both sides of the car. Since the rear pod is free-floating, you must carefully measure each side of the car (axle center to axle center) and adjust the rear-pod turnbuckle linkages until this is achieved.

PERFORMANCE

At the track, the Lynx quickly proved itself to be the car to beat when the running surface is less than

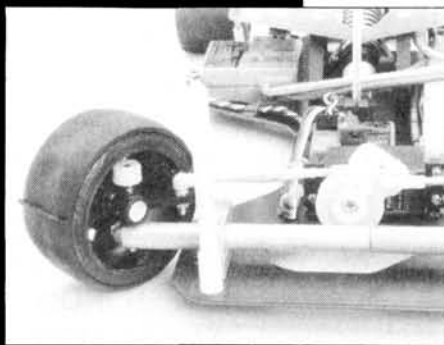
The stakes keep going up in the high-speed oval racing game, and this car is on top of the heap.

times are especially critical. To power the Lynx, I use a Speedworks* Oval Man Tri-Rotor motor.

INITIAL SETUP

To start, I followed the instructions and set the front end so that the inside wheel had 0 degrees of caster and the outside wheel had approximately 2 degrees of caster. I used

Unique to the Lynx SS is this two-piece magnesium cross beam that allows individual caster settings for each front wheel. A nice feature on the Lynx cars is the turn-buckle linkage; it allows quick, easy adjustment.



the stock .022-inch springs on the front, and again, following the instructions, I put a little thick silicone lube on the kingpins to damp the steering blocks.

Correct adjustment of the rear sway bar is especially important on the Lynx SS. This device controls not only the

perfect. The full-floating rear pod smoothed out the bumps and kept all four wheels firmly planted. In some instances, however, the rear seemed to outperform the front, and this reduced steering response. Perhaps the front suspension should be made as sophisticated as the rear. All

(Continued on page 176)

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PROTOTYPE XJ-220

(Continued from page 48)

interior was already black (its proper color), but it was glossy black (not very realistic). I gave it a shot of flat black paint, and *then* it looked real! After I added the decals, I painted touches of silver on the shift knob and the turn signals.

There are many other trim pieces and details that you can attach to the main body with self-tapping screws and small plastic nuts. Unfortunately, most of the screw heads would be visible on the finished body, and that, in my opinion, would detract from the car's scale appearance. To avoid this, I secured the interior and the rear valance panel with two-sided servo tape.

A great deal of thought and engineering went into the kit's design. Even the body-mounting system was well thought out. Mounting "posts" are securely attached to the body with screws, and these posts have matching receptacles on the main chassis. Simply line the posts up with the receptacles, lock them together with the small lever on the

(Continued on page 96)



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ARISTO-CRAFT CHARGER

by JOHN RIST

HOW WOULD you like to have an inexpensive time-set charger that works so well at the racetrack that you can take on the big boys with their fancy chargers? Since I just happen to own an Aristo-Craft* ARI-0822, I wanted to see if it could hold its own against more expensive chargers.

SIMPLE AND EFFECTIVE

The ARI-0822 operates from either a 12V DC automobile battery or 115V AC power, and it's easy to use. According to the instructions, this charger can be used with only 6-cell, 1.2Ah battery pack. This covers the most popular types of battery packs, including those used in the ever-popular 6-cell stock class. The ARI-0822 is a time-set battery charger that operates safely when the battery has been fully discharged. This timed method works because the charger puts out about 3 amps. If you set the timer for 20 minutes, you'll get a 1.0Ah charge on the battery (3 amps x 20 minutes = 60 amp/minutes = 1 amp/hour). This amounts to an 80-percent charge on a 1.2Ah pack. Of course, this gives you less run time, but batteries operated in this mode last longer because they're not constantly being overcharged. For practice runs and backyard running, this mode is fine.

The ARI-0822 has an internal circuit breaker instead of a fuse. If you hear a clicking sound coming from this charger, it's time to shut it down and find the short. The clicking sound is the circuit breaker opening and closing.

The ARI-0822 appeals to

newcomers because it's inexpensive and easy to use. With its 20-minute charge time, you can quickly charge your batteries and spend more time on the track. In the racing world, gearing for speed and still achieving 4-minute-plus

Pocket-Size DVM (part no. 22-171). It costs just \$27.50, yet it's accurate enough. When the voltage falls and the battery is quite warm, it's time to unplug it. Overcharging doesn't improve run times; it only destroys batteries.



run times is important. Entry-level race drivers shouldn't sell the family farm for a new charger; on the other hand, they shouldn't give up 20 percent of their run time.

To safely peak-charge a battery pack on a time-set charger such as the ARI-0822, set another 5 to 10 minutes on the timer, and monitor the battery-pack voltage for a peak-charge. If you connect a digital voltmeter (DVM) across the battery terminals while the battery is charging, the battery voltage will rise slowly. As soon as the battery is fully charged, its voltage will start to fall. Another indication of a fully charged battery is a rise in its temperature. If it has peaked, it will be quite warm to the touch. I use Radio Shack's

FULL IS FULL

The Aristo-Craft charger is great for placing an 80-percent charge on a practice pack. If you're willing to monitor the charger with a DVM, it's possible to safely peak-charge a pack for racing. My first summer of racing was quite successful, and I charged all of my batteries with a time-set charger and a DVM. The big problem is that it can be difficult to watch the DVM and fix the crash damage during the panic between heats. If you're hand-peaking a battery, only you can prevent it from overcharging. Just remember, full is full. Overfull only causes excessive heat and battery damage. So, if you're "manually" peaking a battery pack, keep your eye on the DVM, and watch for a

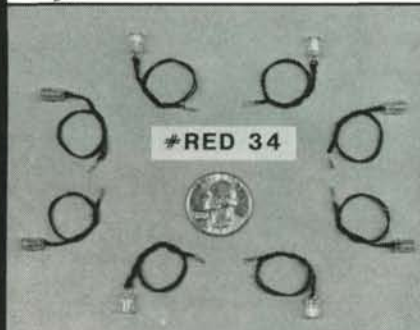
slow rise in voltage. The voltage will rise slowly, eventually stop, and then start to fall. If you're holding the battery pack, you'll feel a sharp rise in temperature as you see the voltage drop. When this happens, disconnect the battery.

I've described the Aristo-Craft ARI-0822 in this article because it's the time-set charger that I happen to own. There are, however, several other manufacturers that offer time-set chargers, e.g., Royal Products* (part no. 102, \$59.95); Panda Radio Control* (part no. 081300, \$49.48); Hobbico* (part no. HCAP0125, \$39.95). Some chargers have ammeters and offer the ability to vary the charging current. Some feature built-in test jacks to plug in your DVM and battery-discharge circuits. Many models will charge 6- or 7-cell packs, but not all time-set chargers operate from both AC and DC sources. If the one you pick isn't for both, make sure that it works with the source that you have available. The list I've given is by no means all-inclusive, and the prices are suggested retail prices. You should be able to find a brand that has all the features you want at a really good price. So, start charging!

**Here are the addresses of the companies mentioned in this article:*
Aristo-Craft/Polk's Model Craft Hobbies, 346 Bergen Ave., Jersey City, NJ 07304.
Royal Products Corp., 790 West Tennessee Ave., Denver, CO 80223.
Panda; distributed by **Global Hobby Distributors**, 10725 Ellis Ave., Fountain Valley, CA 92728.
Hobbico/Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61824. ■

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PROTOTYPE XJ-220

(Continued from page 93)

chassis, and presto!—the body is mounted in position perfectly.

PERFORMANCE

Let me make this clear: the XJ-220 *isn't* a race car! It's designed to provide scale good looks, not to burn up the track. It was, however, a blast to drive this thing around a local parking lot. There were neither turn marshals, nor AMB lap-counting systems; it was just me and my XJ-220. I'd forgotten how much fun it is to drive an R/C car simply for the heck of it. Actually, the 220 didn't perform all that badly; it achieved decent speed, and it cornered with authority, mostly due to its AWD capabilities. In fact, for the photo shoot, I had to drive the XJ-220 while hanging out of the back of Associate Editor John Huber's Ford Explorer, as John dangled precariously from the open tailgate with his camera. To make matters worse, Alex Strouthopoulos was driving the Explorer (it ain't no bus!)—dangerous indeed! The XJ-220 kept up admirably.

The Kyosho Super-Scale Series will appeal to many enthusiasts: racers looking for something a little different; full-scale auto buffs looking for a scale model; and beginners who want something to bash around on dead-end roads or in parking lots. Although its assembly was a little difficult and time-consuming, I had fun with this car. Isn't that what this hobby is all about?

**Here are the addresses of the companies mentioned in this article:*

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

Coverite, 420 Babylon Rd., Horsham, PA 19044.

Dahm's, P.O. Box 360, Cotati, CA 94931.

Custom R/C Graphix, 4138 Boston Rd., Bronx, NY 10475. ■



NOW THAT you've picked a car you can live with (thanks, I hope, to the first part of this series), there are things you'll need to make it go. These things are generally called accessories, but some are more precisely called necessities. They fall into four groups: radio systems, batteries, chargers, and miscellaneous items that make cars go fast.

As I mentioned in the first article, ask your hobby-shop dealer if he'll include some of the accessories in the price of the car. Don't be afraid to negotiate; many dealers are willing to help you get into R/C as inexpensively as possible. Insist on the products that you feel comfortable with; don't settle for what the dealer is currently pushing.

RADIOS

In R/C circles, the term "radio" refers to the radio system that controls the vehicle's speed and course. The radio system for an R/C racer includes a transmitter,

which is the control that you hold in your hand to direct the throttle and the steering; a receiver that translates the radio waves into actions for the throttle and steering; and the servos that are small motors that actually work the throttle and steering mechanism.

These things are generally called accessories, but some are more precisely called necessities.

Like the cars, the prices of radios vary. The schools of thought that apply to buying a buggy also apply to a radio: the wait-and-see school and the I-know-I'm-really-going-to-like-this school. Be advised; the warning "buy cheap and you'll buy twice" applies. A radio system

that's adequate in the backyard may not have the necessary adjustments for the local track.

Assuming that you've selected an off-road buggy for organized competition, there are some points that you must consider before you select a radio.

- Will all the radio components fit?
- Does it have the adjustments needed to make the car respond properly?
- Are the servos strong enough, light enough and fast enough for the car and for competition?
- Is the transmitter control comfortable in your hand? Is it balanced and light weight?
- Are replacement parts available?
- Are its components compatible with other third-party components, like electronic speed controllers?
- Does it have useful features, not just "bells and whistles"?

- Is the price compatible with your budget?

Now, let's look at what's available. There are two types of transmitter: the stick radio and the wheel radio. The box-shaped stick radio was first used for R/C airplanes. The left stick controls the throttle and the right stick controls the steering. Although they're perfectly capable of controlling an R/C buggy, few drivers find them comfortable or as controllable as the wheel radio. Wheel transmitters use a trigger to control throttle and a wheel to control steering. The unit is shaped into a pistol-grip configuration to make your grip more secure and the controls more positive.

I've owned a stick radio, but I couldn't get used to it. Several very successful racers, however, still prefer the stick to the wheel. Hold them both to get the feel of them before you decide which is right for you. Don't fall for the notion that the stick radio

b y B O B G A G N E

GET STARTED

is more versatile and could be used for a boat or a plane if you get into that later. Many powerboat drivers prefer the wheel radio, and the frequencies used for airplanes are different than those used for cars and boats. Since there are relatively few stick radios out there, let's assume that you've decided on a wheel radio.

There are three levels of wheel radio suitable for R/C cars, but some of them lack the features needed for organized competition. The first level includes the "bare bones" models. Generally, they have no steering-rate adjustment, which controls

other features of the system, radio systems at this level sell for between \$90 and \$175. They'll get you started, but you may outgrow them. Models in this class are:

- Airtronics* Vector VT2P
- Altech* ACOMS Technisport
- Cox* Sidewinder
- Futaba* 2PB Magnum Sport
- KO Propo* EX-7 Racer
- Kyosho* Pulsar Pro-2000 and EXP-2001
- Tamiya* Top Gun

Depending on the type of servos included, medium-priced models range in price from \$130 to \$250. They offer much more

adjustability than the bare-bones models. Most have dual-rate steering adjustments to control the left-to-right turning angle, throttle and steering trim

adjustment, servo-reversing switches, and some have endpoint adjustments so that the servo travel can be custom-tailored to your needs. In addition, the receivers are generally lighter and smaller than the budget models. The servos are stronger and adequate for most racing applications. Models available in this group are:

- Airtronics XL2P
- Futaba Magnum Jr. 2PBKA
- Alpina* PCM
- Kyosho Pulsar Pro 2001 EXP
- KO Propo EX-7 Sport, EX-II Turbo GP

Then there are the top-of-the-line, all-out racing radios

that, for the most part, aren't needed by anyone but the pros. Along with all the bells and whistles and flashing lights, they offer such usable features as extremely light receivers and powerful servos, and all of the adjustment options; some even have a third channel. They sell for between \$275 and \$500.

These include:

- Airtronics CS2P, Caliber 3P
- Futaba Magnum AM, Magnum PCM 1024, Field Force PCM 3UCP
- KO Propo EX-5, EX-1 Pro.

For most beginners who are interested in organized racing, the middle-priced radios are the best choice.

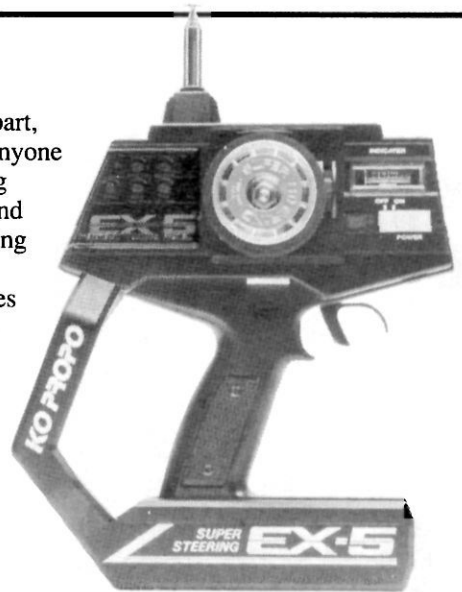
BATTERIES

Batteries—often misunderstood and misused—are one of the most important components for successful racing. Basically, there are two types of battery packs. SCR-

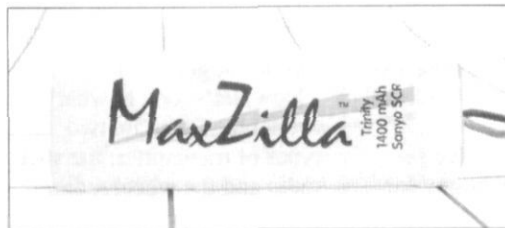
type batteries in the 1200 to 1400mAh range give a higher discharge voltage at a faster rate, which means that you can expect more speed for a shorter period of time. They're particularly well-suited for stock-motor competition in 4-minute races, although many modified-motor drivers are also beginning to use them. Beginners will find them durable and easy to charge. The best way to charge them is still up for debate, but they'll give you good service, whatever the

charging method. They're also the least expensive battery packs.

SCE-type batteries in the 1700mAh range discharge at a lower voltage at a slower, more constant rate, which means you can expect less speed but

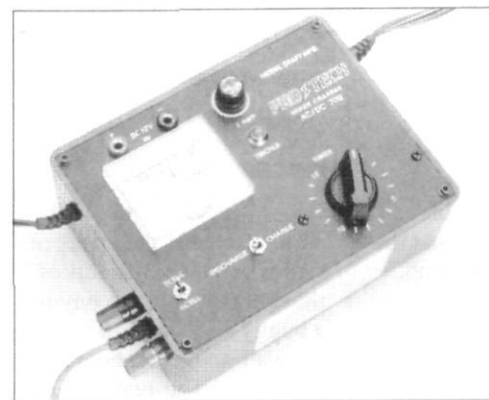


KO Propo's EX-5 radio is great for beginners because it's inexpensive, and it has all the features necessary for racing.



Perfect for beginners or stock-class racers, Trinity's MaxZilla battery is made up of Sanyo's durable 1400mAh SCR cells, which last longer than the conventional 1200s.

how sharply the wheels turn left and right. They do have throttle and steering trim adjustments to center the servos so that the throttle is in neutral when you let go of the trigger, and the front wheels are straight when you let go of the wheel. Some have servo-reversing switches that allow you to reverse the direction of travel of the individual servos—a very handy feature, and necessary for some cars. The transmitters are generally less balanced and less comfortable than the best units. The receivers are larger and heavier, and the servos are slow and not very powerful. Depending on the servos and



Timer chargers like Pro-Tech's 702 are the choice of many beginners. They're less expensive than most peak-type chargers.

more run time. They're usually used for hot-wind modified motors with 17 turns or less and in races that are longer than 4 minutes. SCE-type batteries are very delicate and great care must be taken when you charge them. To get the most life out of these batteries, use them only once a week; then discharge them completely, and let them rest for several days before you charge them again. These batteries are more expensive than SCRs and best left for experienced racers.

ies, you're likely to get 10 different answers. They all seem to get good results, so what does this mean?—as long as you take reasonable care when you charge your batteries, you'll get reasonably good performance. A good starting place may be the battery manufacturer's recommendations.

BATTERY CHARGERS

Picking a charger can be confusing. These electronic wonders are enclosed in a plastic or metal case that you can't see into, and it

charger, which will charge a single battery pack overnight. It's similar to the Ni-Cd chargers for household appliances that run on batteries. They're the least expensive (about \$10 to \$25), but they're also the least useful for the R/C racer. Models offered in this group are:

- Aerotrend Products* Trickle-Charger
 - Radio Shack Trickle-Charger
 - Royal* Battery Charger
 - Tyco Industries* Trickle-Charger
- Quick-chargers are the way

worth the extra money. Some of these features are necessary for safety and convenience. Of course, as you add features, the price will increase. An adjustable timer with automatic shutoff is important because it allows you to set the amount of charge time and automatically shut off the high-amp charge rate before the battery overcharges. Chargers with this feature include:

- Altech DC Charger
- Hobbico* 900
- MRP* Econocharger
- Panda* 30-minute DC/AC auto quick-charger.

An ammeter and variable-rate feature is important so that you can set and check the charge rate for your batteries. This gives you more control over the charging technique used. Chargers without this feature don't allow rate adjustment, and there's no control over how the pack is charged. Units with this feature include:

- Hobbico 905 and AC/DC multicharger
- MRC* RB-460, RB-465, and RB-475 Deluxe
- MRP Digicharger
- Panda AC/DC Charger and Variable Rate Super Charger
- Porta-Power* 3001 Super Charger and "The Hawk"
- Royal AC/DC fast-charger models 101 and 102.

Chargers that have a built-in peak-sensing are a little more expensive. This keeps you from overcharging or undercharging your battery without having to monitor its progress. They also put the best charge possible on the battery automatically. Models include:

- Dialed Racing Products*

(Continued on page 182)



Ideal for all but the most serious R/C racers, the Futaba Magnum 2PBKA stands between an entry-level system and a top-of-the-line racing radio.

Futaba's 2PB Magnum Sport is a good, inexpensive radio to get started with, but it lacks some of the features racers may need to be competitive.

In either case, Sanyo* seems to have a strangle hold on the battery market. Panasonic* and Gates* also offer batteries that are suitable for racing, but the Sanyo cells seem to supply more performance.

Charging batteries is an enigma. If you ask 10 racers how they charge their batter-

wouldn't it make a difference if you could, unless you're familiar with electronic components. Some are powered from a 12V DC source; others plug into a 120V AC supply. The type of charger you choose will depend on whether your power source is AC or DC. The most elementary is the trickle-

to go for competition battery charging. These units will fully charge a battery pack in 15 to 20 minutes, and their prices range from \$30 to \$180. The least expensive unit charges a battery pack nearly as well as the most expensive one, but the features of the more expensive chargers may make them

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NITRO 10

(Continued from page 55)

ers, many fuel-powered 1/10-scale cars are slow and don't handle very well, but the Nitro 10 opens the performance envelope. The powerful Irvine .15 enables the truck to accelerate just as quickly as a truck with a modified motor. Forty feet down the straightaway, however, the Nitro 10 leaves its electric-powered brethren in the dust. The truck seems to be well balanced because it takes the turns very smoothly. Its center of gravity is slightly higher than in the electric Shotgun version (this can cause problems), but the difference is hardly noticeable.

After the first few runs, I modified the truck slightly. Some of the changes were made to improve its performance; others were made to satisfy my need to modify everything I touch. The kit's aggressive vee-pattern tires were too slippery for the hard-packed track on which I conducted the tests. I replaced them with Team Losi* mini-pin spike rear tires and ribbed front tires, and they greatly improved the handling. The stock bushings in the truck's transmission were showing signs of wear (owing to the punishment dished out by the Irvine .15), so I replaced them with ball bearings.

Although the truck performs very well without them, I made a few "ego-stroking" mods. (What can I say? I live a life of excess!) First, I added Schumacher's aluminum transmission housing and Pro Diff kit. The housing is more rigid than the stock plastic unit, so it keeps the parts perfectly aligned and the tolerances very tight. The aluminum Pro Diff diff does the same, so it also operates very smoothly. For the icing on the cake, I had MK Engineering* hard-anodize the aluminum components. The cost of such a process can be prohibitive, and it offers few benefits, but I love trick stuff!

The Schumacher Nitro 10 is a strong performer and is, without a doubt, at the head of its class! Such status doesn't come without cost, though: the truck has a very hefty price tag. Its instructions lack detail, and some of the assembly steps are beyond the abilities of novice builders. For experienced (and wealthy) racers, though, the Nitro 10 is a bona fide blast!

*Here are the addresses of the companies mentioned in this article:

Schumacher Inc., 6302 Benjamin Rd., Ste. 404, Tampa, FL 33624.

Associated Electrics Inc., 3585 Cadillac Ave., Costa Mesa, CA 92626.

Parma International Inc., 13927 Progress Pky., N. Royalton, OH 44133.

(Continued on page 137)

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Radio Control **Racer**



ATTENTION ALL RACERS! Welcome to the third installment of Radio Control Car Action's R/C Racer section. Why devote part of the magazine to racing goodies?—because you demanded it and, at Car Action, readers' desires are our primary concerns.

We seek out the very latest R/C hardware and “bring it back alive” to keep you updated on new developments and trends as well as who the hot and/or up-and-coming drivers are. There's plenty of excitement to be found in this issue. The “Nitro-Newster” himself, Jeff Bronstein, reports back from Texas on the '91 IFMAR 1/8-Scale World Champs. We're pleased to present the first article from a new author—Bill Bacon—titled, “Tire Tech,” and Steve Pond again proves that there's no limit to his imagination (and bank account) as he unveils his latest creation—Project Turbo Burns!

We hope that R/C Racer will provide you with the extra information you need to shave that crucial 1/10 second off your lap times.

Contents

- 106 IFMAR 1/8-Scale World Champs
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- 116 Project Turbo Burns
- 122 How To: Tire Tech



by JEFF BRONSTEIN

ONCE EVERY six years, the greatest R/C racing spectacle returns to the U.S. One hundred and fifty of the world's elite drivers, representing 24 countries, contend for the coveted title of IFMAR^{1/8}-Scale World Champion. It's the ultimate challenge in world-class competition.

The venue for this year's championship was Kinnison Speedway in Austin, TX. This permanent facility is located near the state capitol in the heart of downtown Austin. Short by European standards, the quick track gave Team USA drivers the advantage, but speed was also essential on the 250-foot back straight. A large freeway overpass sheltered the pit area, and it provided protection from the threatening thunderstorms and intense sun.

During the first week of practice, several mechanics had problems with their engines owing to the humidity and heat changes. This was the first time the Championship had ever been held in a hot, humid region of the U.S., and most people had to start from scratch.

IFMAR's race format includes more than five days of intense qualifying and "move-up" Mains. After six rounds of qualifying, the top four drivers have a straight

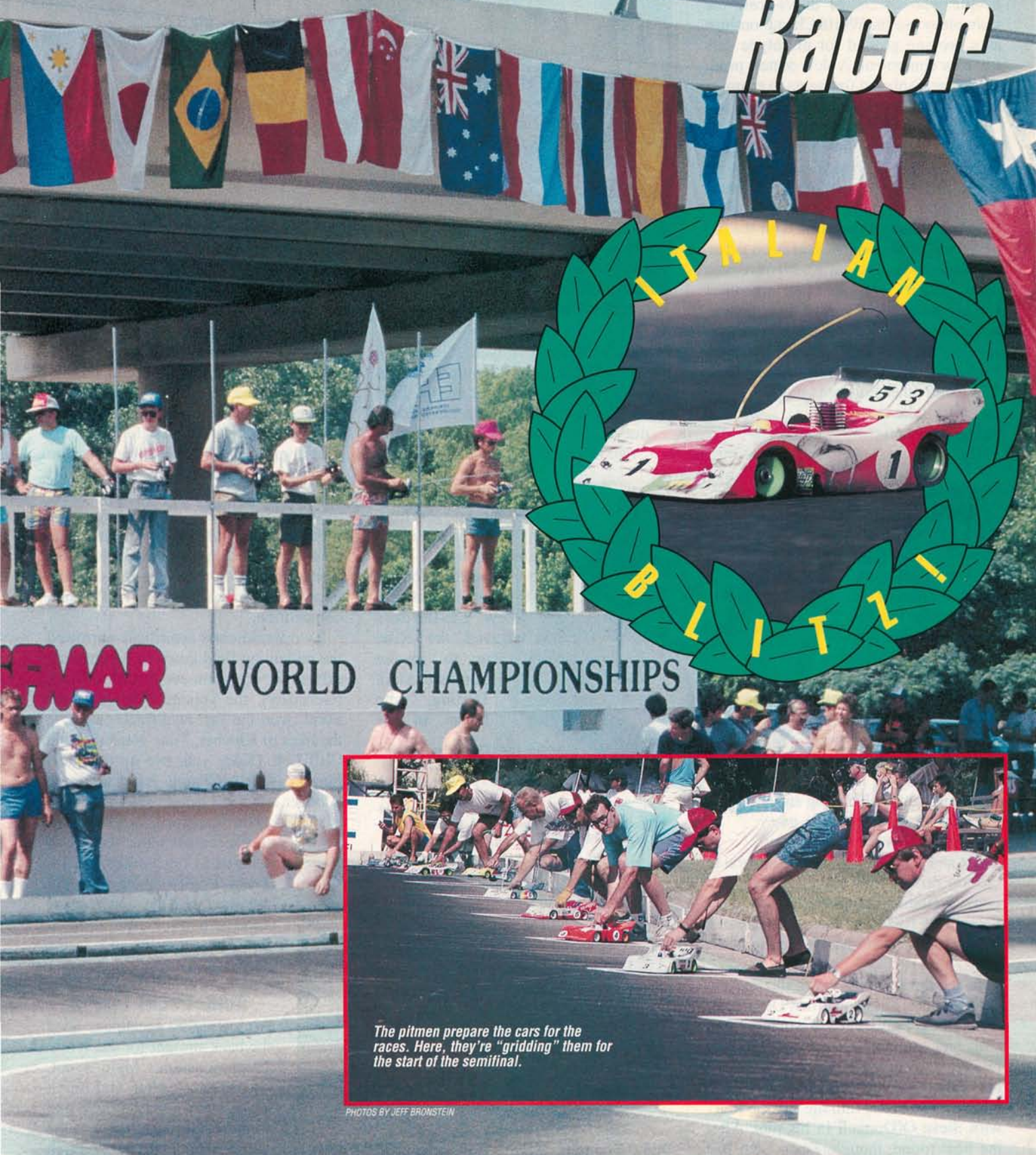
shot to the Main event. To fill the remaining six slots, the rest of the drivers race head-to-head in a series of 20-minute Mains.

For pre-event "favorites," few looked further than reigning World Champion Lamberto Collari and ROAR National 4WD Champion Ralph Burch Jr. Collari had the sophisticated BMT Blitz car on his side, but Associated and Ron Paris of Paris Racing were in Burch's corner. In a field of top drivers, however, anyone could take the title with a solid drive.



IFMAR^{1/8}-SCALE WORLD

RADIO CONTROL
Racer



The pitmen prepare the cars for the races. Here, they're "gridding" them for the start of the semifinal.

PHOTOS BY JEFF BRONSTEIN

CHAMPIONSHIPS

Many of the major manufacturers and people who specialize in 1/8-scale car technology use the World Championships as a proving ground for prototype cars and new equipment. A slew of new products were displayed for racers to examine between rounds. (For more details, see "Nitro News," December '91.)

Team Serpent showed off its Sprint 6020 kits, and '85 World Champion Rody Roem of Holland made one of the most anticipated introductions—the trick Sigma car that he designed with the aid of Parsec. If the winner had been determined on looks, this car would have won hands-down. Italian manufacturer Campagnucci displayed a radical new EFRA-style car with a 3-speed transmission, 4-wheel brakes and a new "poliamid"/fiberglass tub-type chassis. These and other European manufacturers take 1/8-scale racing very seriously.

QUICK TO QUALIFY

Team Italy showed that it meant business from the onset of the competition. The first day of qualifying belonged to Alberto Picco (Italy), the namesake of both car and the engine. Picco's 36-lap drive established the time to beat, and he was followed closely by teammate Massimo Fantini. Utilizing an advanced front-suspension geometry, Picco's car looked very stable and solid in the corners. Several of the top drivers also used the Picco engines, including the powerful F1 and the Serpent P5 (made by Picco). At the end of two rounds, Italy was at the top of the list.

In the third round, Burch dazzled everyone with a 37-lap qualifier. Despite the difficulties Team Paris/Associated had with fuel economy (Burch had to make two pit stops in the 10-minute qualifier), his time seemed unbeatable. Butch Kloeber also broke into the "magic four" with Steve O'Donnell in his pits. After the final round, though, Team USA just didn't have the stuff to stay on top. Burch managed to hold on to the second spot, but Kloeber was bumped out. World Champion Collari claimed the TQ honors with a flawless drive, while Team



Massimo Fantini and Roger Sahli's cars speed under the timing bridge—door handle to door handle.

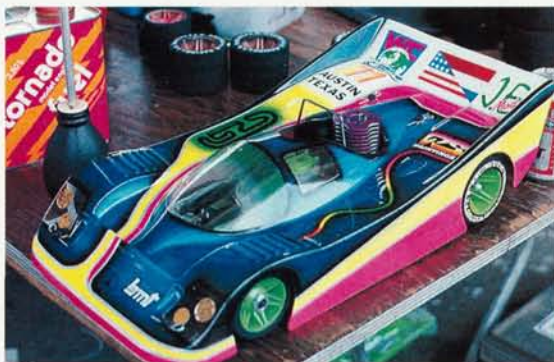
Serpent's Michael Salven (Germany), winner of this year's Winter Nats in Florida, and Picco rounded out the final four. The rest of the field had to battle it out for the remaining six positions in two more days of move-up Mains.

MOVIN' UP

Only the top three drivers from each move-up Main could advance to the next level, so competition for the top spots was intense. New Zealanders waved the Kiwi flag to inspire teammate Mark Harling, who began in the

Left: This entrant came all the way from Thailand to compete. Check out that paint job!

Below: This was just one of the many outstanding paint jobs displayed at the Worlds. Notice the track layout on the car's right side.



first move-up Main and advanced through five races before he was eventually eliminated.

ROAR National 2WD Champion David Campbell led his final race until the last minute when his prototype Delta/

Hatch-mobile started to lose power. To regain 3rd place, he made a wild, desperate move in the last corner of the final lap; he tried to ricochet his car around Karl-Hinz Meister (Germany) before reaching the timing bridge, but this only netted him a broken car and a spot in the bleachers for the finals. After the race, he commented, "Sometimes you have to do what it takes to win." Even Don Jones, who was eliminated through no fault of his own, appreciated this once-in-a-lifetime opportunity to compete in world-class competition.

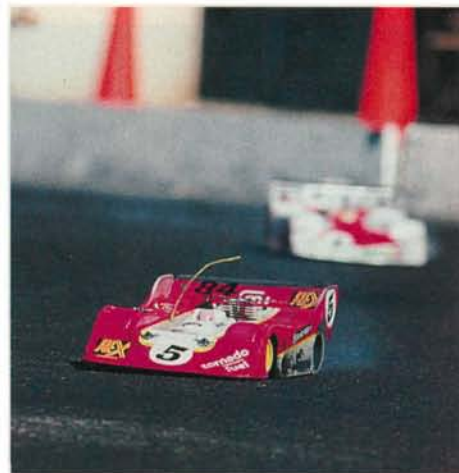
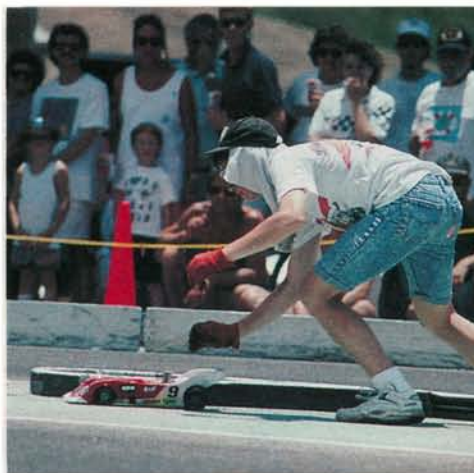
Two world-class semifinals narrowed the remaining field down to the final six drivers for the Main event. Oliver Mack (Germany), the youngest driver at the event, won the first semifinal, defeating the likes of Kloeber, Tony Neisinger and Cliff Lett. (Keep your eye on this kid!) Former World Champ Art Carbonell, Kloeber and Jack Ermen (Holland) also advanced to the finals with the youngster.

In the second semi, youth also seemed to be the key. At 14, Team USA's Mike Swauger ran away with the race from the halfway mark. Fantini finished 2nd to capture his spot in the finals.

MAIN-EVENT MANIA

Almost 2,000 spectators lined the back straight for the World Championships' Main event. At the start, Collari and Burch broke away from the field and went head-to-head for 5 of the

most intense minutes of the race. Burch stayed in the shadow of the champ—almost toying with him—for the first 20 laps. In the classic Burch style, he studied the leader, looking for a flaw, but the steady Italian showed none. The crowd



Above left: All fueled up and ready to go! (Notice the quick-fuel gun.) Above center: Marshalling for 1/8-scale gas cars is probably more difficult than for any other class. The cars have piping-hot engines, and they reach speeds of up to 70mph, so it can be very dangerous. Left: Ron Paris (left) is the man behind Paris Racing Products.



IFMAR 1/8-Scale World Championships

Fin.	Qual.	Name	Country	Car	Engine	Body	Radio	Tires
1	1	Lamberto Collari	Italy	BMT	NovaRossi	VDS Lola	JR	Arrow
2	7	Massimo Fantini	Italy	BMT	Rex	VDS Lola	JR	Arrow
3	3	Michael Salven	Germany	Serpent	Serpent	Parma VDS Lola	KO Propo	GTS/Grand Prix
4	6	Mike Swauger	USA	Associated	Paris/Rex	Elfin Can-Am	Airtronics	Gomme
5	4	Alberto Picco	Italy	Picco	Picco	VDS Lola	KO Propo	GTS/Grand Prix
6	8	Butch Kloeber	USA	Associated	O'Donnell	Elfin Can-Am	Airtronics	Gomme
7	5	Oliver Mack	Germany	Serpent	Serpent	Parma VDS Lola	Futaba	GTS/Grand Prix
8	10	Roger Sahli	Switzerland	Serpent	OPS	Parma VDS Lola	Multi Plex	GTS/Grand Prix
9	9	Art Carbonell	USA	Picco	Picco	Parma VDS Lola	KO Propo	GTS/Grand Prix
10	2	Ralph Burch Jr.	USA	Associated	Paris/Rex	Elfin Can-Am	Futaba	Gomme

was on its feet when Burch, coming onto the back straight, finally broke outside to take the lead. The euphoria quickly ended, however, when Burch's car ducked into the pits and allowed Collari to regain the lead. Although it appeared

to be an ordinary fuel stop, Team Associated was having problems with Burch's radio. He stayed within striking range for the next 5 minutes, but was never a real threat from that point on. When his car became uncontrollable, he reluctantly

pulled it off the track and watched the rest of the race from the pits.

Home-court advantage wasn't enough for Team USA to reach the winners' circle this year. Kloeber started off well and worked his way up to 3rd place with



SHOW-STOPPING STOCK?

When we feature the winners of prestigious races, e.g., the Nationals or the Worlds, we usually examine all the changes that were made to a production car that enabled it to perform so well. The recent 1/8-scale World Championships winner, Italy's Lamberto Collari, drove a BMT 891, and it presented us with a new challenge: it was almost completely stock!

The two-time Worlds-winning BMT has a double-deck aluminum chassis, a four-wheel independent suspension, oil-damped shocks, a two-speed centrifugal transmission and a belt-drive system. On the surface, the car seems simple, but much of what made it so suc-

Salven hot on his tail. They battled it out until Kloeber tangled with two slower cars. The only obvious damage was a broken antenna, but he slowly dropped back in the pack to finish 6th. Although Collari continued to drive flawlessly, Fantini and Salven were still on the same lap for 2nd. Team BMT was there to win,

and they pulled out all the stops to prepare their cars. Salven, on the other hand, had altered his race setup just before the Main event and really hadn't had time to track-test the changes.

Near the end, Swauger and Picco dazzled the crowd as they diced it up on the back straight. Swauger held the Ital-

ian off, and he held on to 4th place—the best U.S. position. Collari finished the race without making a single mistake in 60 minutes. Fantini stretched out a half-lap lead over Salven to take 2nd place, giving BMT a one-two finish.

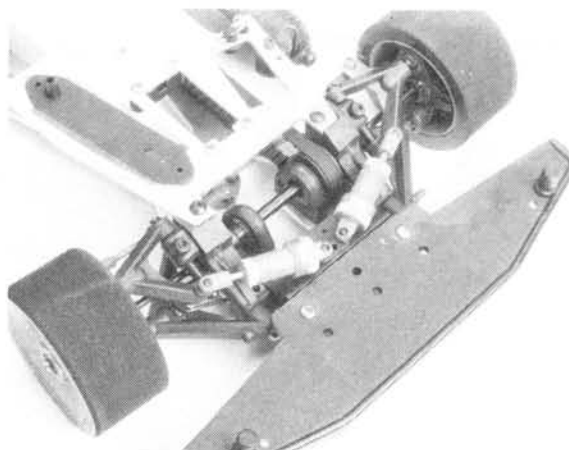
cessful had to do with its versatile design.

The front suspension features upper and lower arms much like those used on some off-road cars. The lower arms are attached to the chassis in the usual locations, and there isn't any built-in rake. The upper arms, however, set a new standard for suspension design in 1/8-scale cars. The angled arms have a great deal of forward rake, and this improves the car's cornering abilities without using heavy differentials. When the car enters a turn, the load is placed on the outside of the front suspension, and this causes the front suspension to be compressed. As this happens, the outside upper arm's forward angle reduces the caster at the steering block, and this improves the car's steering. When the car enters the straight-aways, the suspension unloads, the caster angle increases, and this makes the car stable.

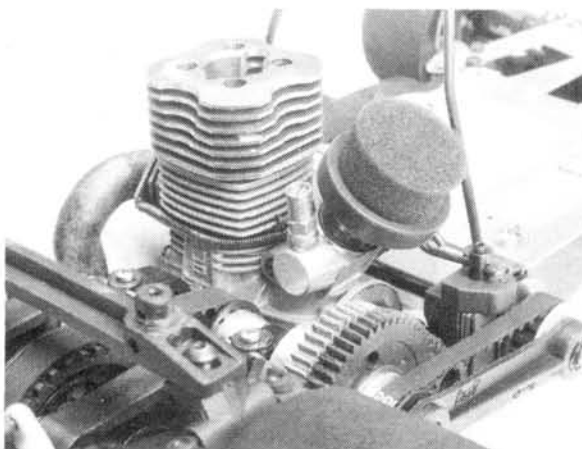
The 891's rear suspension has conventional upper and lower A-arms. The extra holes in the hub carriers allow you to change the camber rise rate and make standard caster and camber adjustments.

The drive train consists of a two-speed centrifugal transmission that's connected to the front and rear drive systems by an efficient belt-drive system. Although the car doesn't have differentials, its front wheels ride on one-way bearings, which provide the front end with a differential effect.

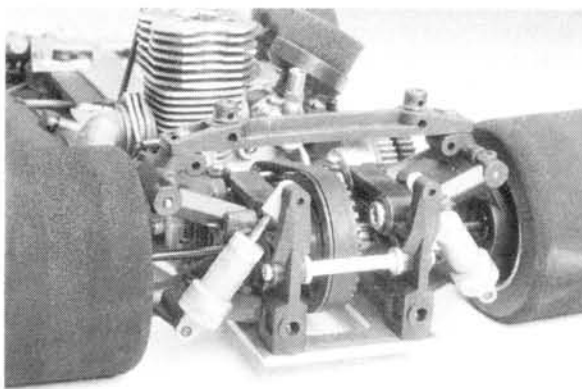
For the Worlds, the BMT 891 was powered by the new NovaRossi Turbo Top 350 10-port engine. It had a Rex short header and a NovaRossi no. 20 tuned pipe. Congratulations to Collari and to BMT for winning their second consecutive 1/8-scale World Championships.



The 891's state-of-the-art front suspension has upper control arms that are raked forward. This reduces the caster when the suspension is compressed and improves the car's agility during cornering.



For world-championship horsepower, Collari used a NovaRossi Turbo Top 350 10-port engine. Attached to it is a two-speed centrifugal transmission with color-coded gears.



The BMT 891 has separate hydraulic dampers and uniquely shaped springs on the lower control arms.

ON TOP OF THE WORLD

As the race cars pulled into the pits, a crowd of frantic Italians swarmed the track trying to congratulate their champion. First-time repeat winner Collari was so excited that he overlooked the presentation of the Parma World Championship Trophy to phone his father in Italy with

the good news. When the results were finally made official, the Italian team broke out in a chorus of "Volare."

The official finale of "the greatest R/C racing spectacle" was the huge banquet honoring the winners and the presentation of the sterling Parma World Championship trophies by IFMAR president Ted

Longshaw. World championship racing may not return to the U.S. for eight years or more, and for many racers this was a once-in-a-lifetime occurrence. As the host of international racers headed home, however, preparations for the next World Champs had already begun. ■

SPEED *SHOP*

Descriptions of the products shown on these pages were derived from press releases supplied by manufacturers and/or their advertising agencies. The information given is neither an endorsement of the product by *Radio Control Car Action*, nor a guarantee of performance or safety. If you write to the manufacturer about any product described here, be sure to say that you read about it in *Radio Control Car Action*.



PURE-TECH RACING PRODUCTS

• Car/Truck Stand

Pure-Tech's one-piece, acrylic, R/C car/truck stand is stable and light. It comes with non-slip pads that hold the vehicle in place while you make those last-minute adjustments in the pits. This transparent stand is available in four colors.

Part no. 00029

Price: \$7.95

For more information, contact Pure-Tech Racing Products, 1611-A S. Melrose Dr. #180, Vista, CA 92083.

RPM

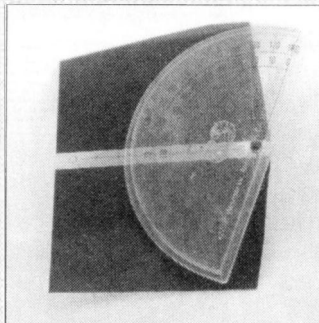
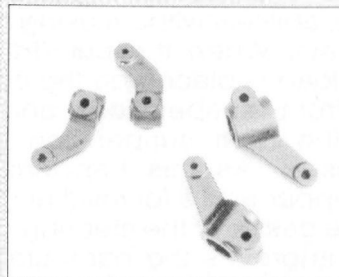
• RC10 Front and Rear Spindle Set

RPM's RC10 spindle blocks and carriers are injection-molded of very tough black nylon. They have the same geometry as stock spindle blocks and carriers, but they've been beefed-up in all the right places. Buy them in pairs or, to save money, in full sets!

Part no. 7009

Prices: \$4.95/pair (front or rear); \$8.95/set of 4.

For more information, contact RPM, 14978 Sierra Bonita Ln., Chino, CA 91710.



McLIN RACING

• Camber and Caster Tool

McLin Racing's Camber/Caster Tool is an easy-to-use device that simplifies the tedious job of setting your race car's camber and caster. You won't have to guess anymore! You'll be able to make accurate adjustments in minutes, even in between rounds of racing!

Price: \$12.95

For more information, contact

McLin Racing, 4314 W. Hundred Rd, P.O. Box 1270, Chester, VA 23831.



TRINITY PRODUCTS

• Panasonic P-170 SCR Battery Packs

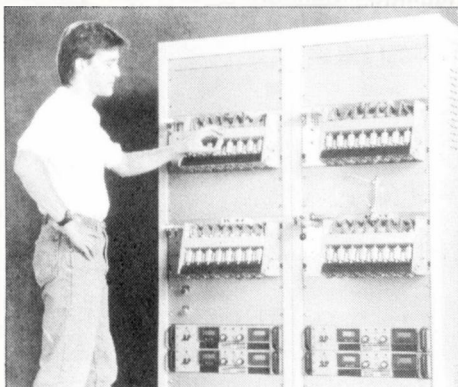
Until now, only a few factory racers could get these new Panasonic P-170 SCR batteries. Soon to be ROAR-legal, these cells provide the superior performance of SCE cells, but they're as durable as the best SCRs. Their internal construction allows them to be charged repeatedly without a loss of

performance! All P-170 battery packs are processed in the same way as their Sanyo Trinity counterparts.

Part nos. 5770 to 5780

For more information, contact Trinity Products Inc., 1901 E. Linden Ave., #8, Linden, NJ 07036.

Radio Control *Racer*



STAGE III • Variable-Load Cell Testing Service

Stage III introduces the first Ni-Cd Testing/Matching Service. To accurately test and match cells, the system uses a programmable variable-load discharge to duplicate in-use duty cycles. Cars don't race at a constant 10, 20 or even 80 amps; drivers are

continually on and off the throttle, and this delivers a dramatically different loading profile. Stage III's system offers a virtually unlimited custom-current loading to suit any anticipated use/duty cycle, and the company has enough testing benches to condition, cycle, test and match more than 1,800 cells each day.

For more information, contact Stage III, 1189 Chicago Rd., Troy, MI 48063.

T.A. EMERALD • Mach One Motors

T.A. Emerald Industries is proud to introduce its Mach One line of modified racing motors. These dyno-tested motors produce up to 60,000rpm (depending on voltage), and they come with dual precision ball bearings and diamond-trued commutators. Each is hand-wound and hand-built by "Big" Jim Greenemeyer, former president and chief motor builder of Checkpoint Racing. Mach One modifieds are available in six track-tested winds: 11-turn quad, 12-turn triple, 13-turn quad, 14-turn triple, 15-turn quad and 16-turn quad.

Part no. 1600

Price: \$80

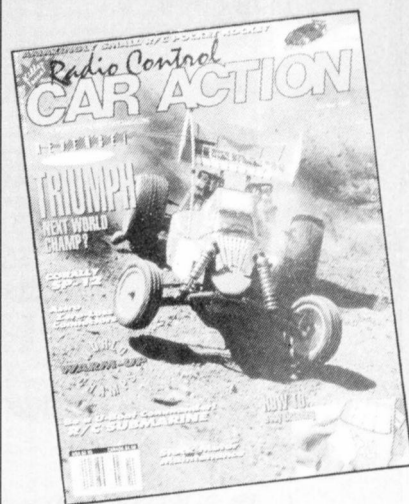
For more information, contact T.A. Emerald Industries, 14392 Hoover St., Unit C-8, Westminster, CA 92683.



EDITORIAL OPPORTUNITY



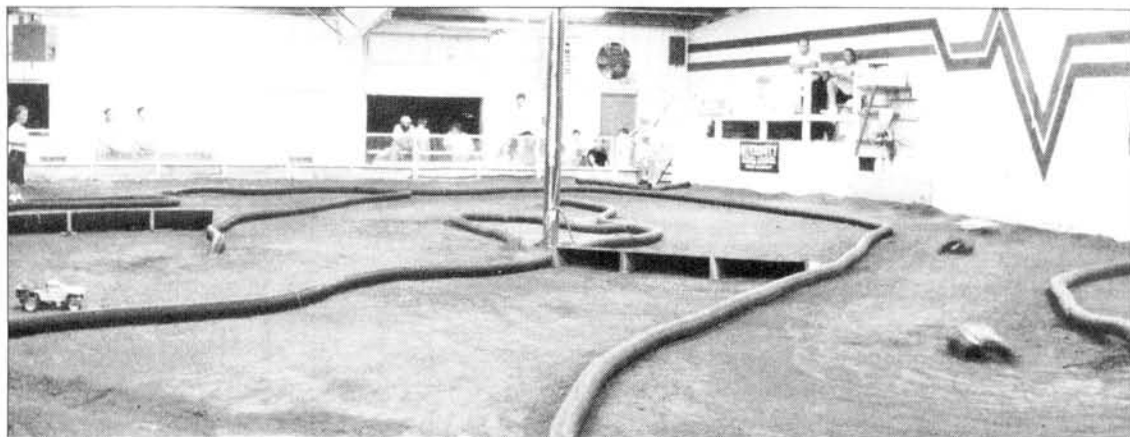
Associate Editor



Air Age Publishing, Inc., publisher of *Radio Control Car Action* and other hobby-related publications, is looking for a creative, motivated individual who is interested in a magazine career. You'll work on *Radio Control Car Action* and related special publications and books. You must have an in-depth knowledge of the R/C hobby and some writing experience. This is a great career opportunity with a fast-growing company. Send your résumé to:

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HOT TRACKS



ACTION R/C RACEWAY, BOULDER, COLORADO

BOULDER, CO, is home to TV's *Mork & Mindy*, to the NCAA football champions—the Colorado University Buffaloes—and to one of the largest indoor, off-road, R/C, dirt tracks in the state.

Tom Barber, owner of the Action R/C Raceway, is very



proud of the progress he has made since he took over the facility in December 1990. He has expanded the track from its original 45x35-foot layout to a monstrous 95x45-foot course. A fully equipped pit area (with electricity) that can accommodate up to 50 racers and a well-stocked hobby shop that

features the best brands of car/truck kits, parts and accessories complete the scene. Competitive prices and a relaxed, friendly atmosphere make Action R/C the place to be!

"This is a hobby, not a cut-throat, do-or-die sport; besides, I like to have fun, and I want everyone who comes here to do the same," explains Tom. To promote this attitude, Action R/C stages wild truck pulls and races every other Sunday, giving USA-1, Clod Buster, Big Brute and Blackfoot owners the chance to compete. The pullers use MaxTrax Eliminator sleds and compete in the usual fashion; the monster trucks are paired off for straight-line races over mounds of dirt—just like the races on ESPN! Rows of empty soda cans strategically placed on the course give the challenge a unique twist.

Stadium trucks and buggies—stock and modified—do battle every Wednesday and Saturday night. It's not unusual to see action-hungry spectators fill the bleachers to witness the ex-

cellent competition.

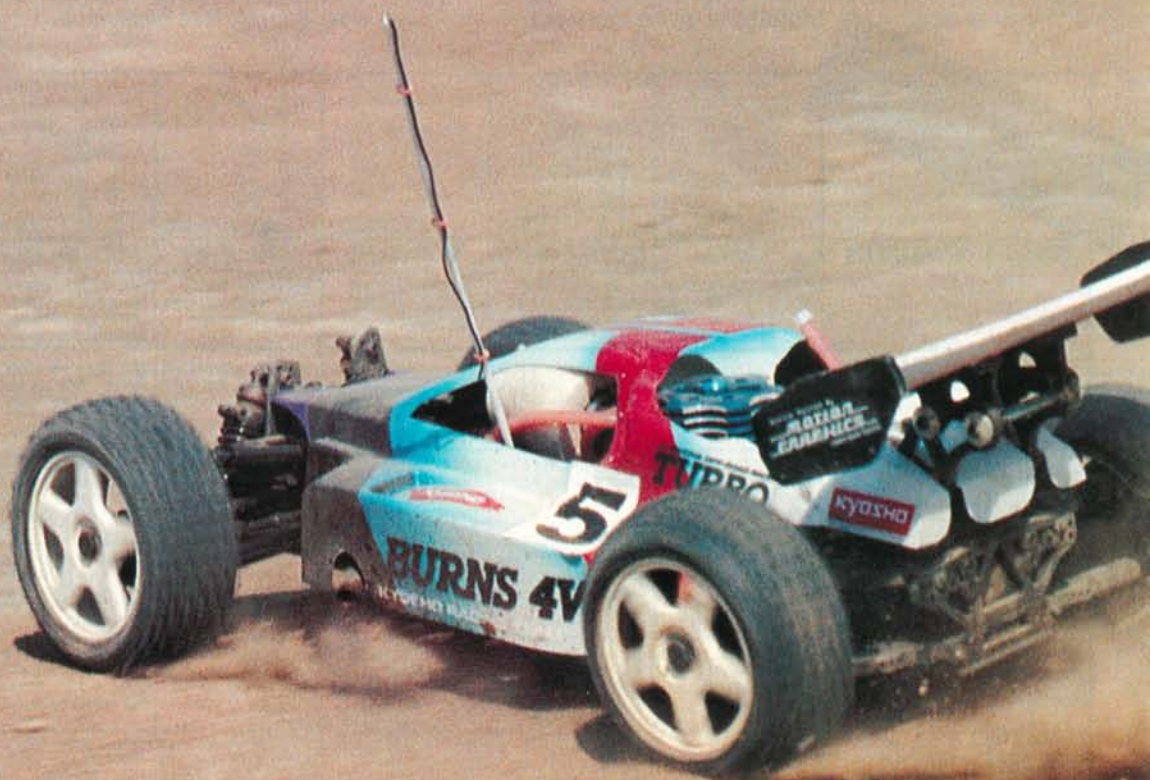
To keep drivers on their toes, for a once-a-month event, the track is changed, and Tom particularly enjoys this. Many of the regular racers show up to help out and participate in R/C soccer! End goals are set up, teams are formed, and drivers use their vehicles to push a ball into a score zone! "I'm thinking about staging a 'lights-out' race this winter, in which each car would have a large, glow-in-the-dark sticker on its body, and the course would be outlined with luminescent material as well," muses Tom. He constantly looks for ways to make the track "fun to the max!"

Next time you visit Colorado, take your R/C vehicle to Action R/C Raceway, 4939 N. Broadway, #57, Boulder, CO 80304; (303) 440-0330. The track and hobby shop hours are Tuesday through Friday, 10 a.m. to 9 p.m.; Saturday, 10 a.m. to 11 p.m.; and Sunday, 12 noon to 6 p.m. ■

by STEVE POND

GAS-POWERED, 1/8-scale buggy racing is an off-road racer's ultimate challenge. Racers have to start the engines of these drastically overpowered cars and keep them running for the duration of the race. As the cost of competitive electric racing increases, however, many drivers are willing to meet the additional challenges that nitro-powered racing presents; they're rewarded with the awesome performance that these cars can deliver.

Although nitro-powered 1/8-scale off-road race cars aren't new, it wasn't until recently that manufacturers began to improve the performance and reliability of these machines. The Kyosho Turbo Burns is a prime example of the recent developments that make the cars of just a few years ago seem primitive. The car includes many high-tech features, including independent suspension with purpose-built, high-capacity, oil-filled shocks; center, front and rear bevel-gear differentials; and ultra-strong components throughout.*



TURBO

Although this car and others in its class reflect the tremendous progress that this industry has made in just a few years, I find that much of the technology that makes electric-powered cars so awesome is still absent from nitro-powered buggies (mostly because the popularity of these cars pales in comparison to that of electric cars). Still, as an avid nitro-powered buggy fanatic, I wanted to see just how much performance I could squeeze out of one. With the Kyosho Turbo Burns as my subject, my goal was to make the car perform to its maximum potential using readily available parts.

Pushing the envelope!

PHOTOS BY JOHN HUBER



BURNS

Radio Control
Racer

HI, WE'RE THE REPLACEMENTS

Few companies make after-market parts for the Turbo Burns; in fact, none of the manufacturers of purpose-built parts is U.S.-based, so my choices were limited to factory-made parts and other general accessories that could be adapted to fit the car. With a fresh Turbo Burns kit strewn across my large workbench, I began to examine what I could change to improve the car's performance.

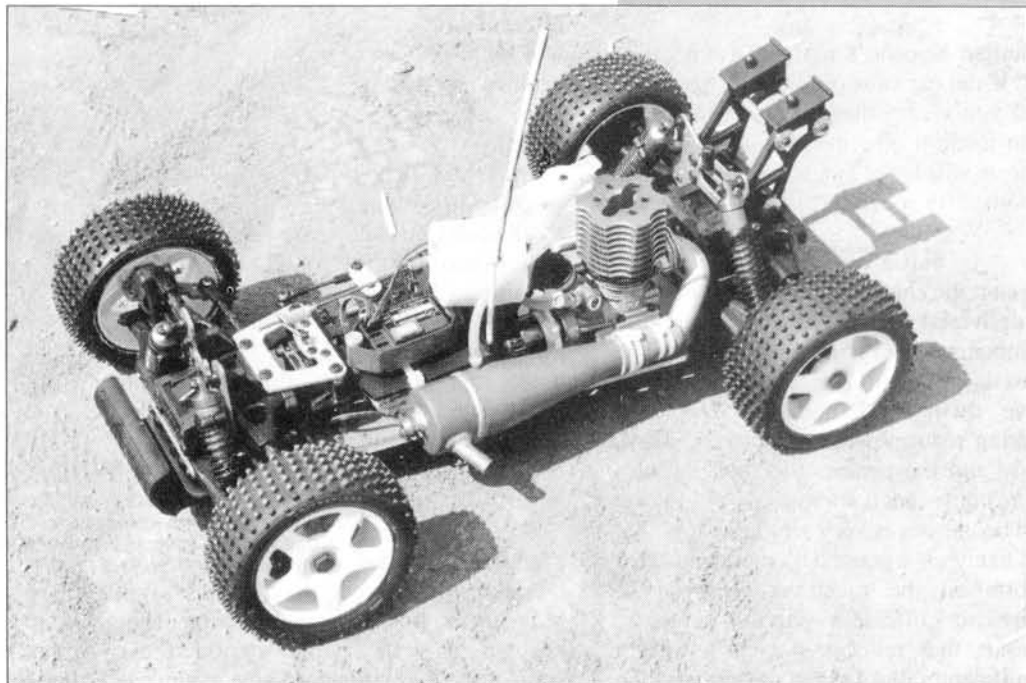
First to go were the ball bearings. I knew from previous experience that, despite the bearings' high quality, the microscopic openings in their metal shields allow dirt to get inside and wreak havoc. I knew that within four or five runs, even paying careful attention to maintenance but without actually taking the car apart, I'd have at least one seized bearing.

I accidentally discovered that the bearings included with Schumacher's* 1/10-scale off-road cars are exactly the same size as those used in the Turbo Burns. You might think that bearings used in a 3.5-pound electric car could never hold up in an 8-pound nitro-powered car, but these bearings are of very high quality and they feature a rubber seal that keeps out *all* dirt and debris. This makes the bearings virtually maintenance-free, except for an end-of-season inspection and cleaning. Replacing the stock bearings is difficult because you must dismantle the pre-built differentials, but it's well worth the effort.

While the diffs were in pieces, I cleaned out the grease that's packed into them at the factory, and I re-lubricated them with Ronnie Grease from Paris Racing*. Ron Paris uses this grease to build his awesome 1/8-scale on-road racing machines. It has excellent "cling" characteristics that help to prevent it from flying off components at high speeds.

At the same time, I shimmed the diffs for proper ring and pinion gear mesh. This isn't really a modification (in fact, the shims are included in the kit), but it's an important step often skipped by racers in their zeal to get the car on the track. I can't stress how much these steps help the

gears to handle the brute power that nitro engines can deliver. Just the few-thousandths-of-an-inch difference these shims make can mean the difference between two or three races and an entire



season of service from the gears.

Before I re-assembled the center diff, I installed a Kyosho steel spur gear, which holds up better than the stock plastic one. This gear was actually included in Kyosho's Vanning/Integra 1/8-scale cars, but it's now available as an option for the Turbo Burns. The center hole in the steel gear is smaller than the one in the plastic gear, so the diff must be disassembled to install it, but again, it's worth it.

BRAKE IT UP!

I installed Kyosho's new fiber brake disk on the center diff. The kit's original plastic disk worked, but to prevent it from melting, adjustment was critical. Newer Turbo Burns kits include a disk to which you glue thin fiber pads (one on each side) to avoid the melting problem, but too much glue in one spot behind these pads can cause a high spot on the disk, and that could make for very choppy braking. The new disk is solid fiber; it's very flat for smooth operation, and it's much less susceptible to damage caused by poor adjustment.

To improve handling under braking, I

TURBO PROJECT BURNS

MODIFICATIONS

- Schumacher 8x14mm sealed bearings
- Paris Racing Products Ronnie Grease
- Kyosho steel spur gear
- Kyosho fiber brake disk
- Kyosho front brake kit
- Kyosho steel shock-mounting bushings
- Kyosho turnbuckles
- Universal-joint drive shafts (rear)
- O.S. RX-B engine
- Hayes fuel filter
- Paris 180-degree header
- Paris AL-650 tuned pipe
- Paris Bullet-Proof Exhaust Coupler
- K&N R/C 2850 air filter
- Kyosho one-piece flywheel
- Airtronics 3P Caliber Radio
- Kyosho 15-tooth clutch bell
- Kyosho engine mount
- Airtronics 94151 servo
- Airtronics 94152 servo
- O'Donnell Racing 20-percent nitro fuel

TURBO PROJECT BURNS

installed Kyosho's optional front brake kit. If the car uses only the center brake and you've set the center diff loose to gain traction on slippery tracks, its rear wheels will lock. The front brake allows you to carry speed further into the turn.

SLICK SUSPENSION

To start the chassis and suspension mods, I delivered many of the aluminum components, including the shocks and the chassis plate, to MK Engineering* to have them hard-anodized. The hard coating reduces wear on both the shock body and the piston, and this provides more consistent damping.

The chassis is very strong as it is, but it's likely to be gouged by rocks and other debris on the racetrack. Hobbico's* DuraTrax offers a suitable graphite chassis that reduces the car's weight significantly, but I opted to stay with the aluminum chassis because it acts as a heat sink. Other racers have run the graphite chassis without any heat problems, and they claim that the aluminum chassis doesn't make a difference to the engine's temperature. When I pick up the car after a run, however, under the engine, the chassis is *hot*, so it must be doing *something* to draw heat from the engine.

Hobbico also offers fiberglass shock towers for the Turbo Burns that have

many more holes for shock positioning, but I stayed with the stock aluminum towers. It seems that the shock-mounting holes in the fiberglass towers don't match up with the stock shock tower, which I found worked well at the track I run on most often. The aluminum towers are more susceptible to damage caused by bending, but the fiberglass ones would just spring back, so you may want to consider these.

Other trick little suspension items are Kyosho's steel shock-mounting bushings. I used these to replace the stock plastic units that would allow the shock-mounting screws to bend in a severe crash.

Kyosho turnbuckles replaced the stock threaded rods on the upper links and steering. The turnbuckles aren't necessary, but they sure make assembly and fine-tuning a breeze compared with using the stock links.

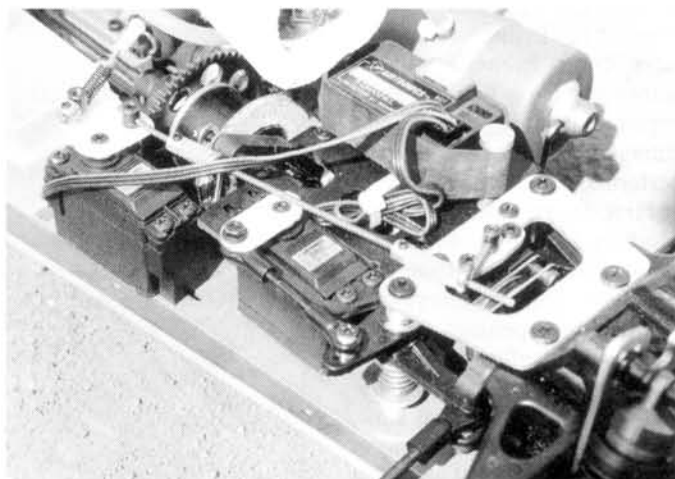
My final additions to the chassis were universal-joint drive shafts for the car's rear (front-end drive shafts are included in the kit). The drive shafts run more smoothly than the stock dogbones, and they're especially beneficial when the car is braking hard or accelerating. There's much less binding, so the suspension can move freely under most conditions.

I cut down the kit's front bumper to prevent the tires from rubbing against it when turning hard. If you hit something, you're likely to catch the wheels, with or without the bumper, so its length isn't critical; the bumper is just there to

cushion the blow of a head-on hit.

PACKIN' HEAT

The engine I chose for the Turbo Burns is the new O.S.* RX-B. This purpose-built engine is supposed to produce much more power than the EX-B it replaced. It has a slightly larger heat-sink cylinder head for

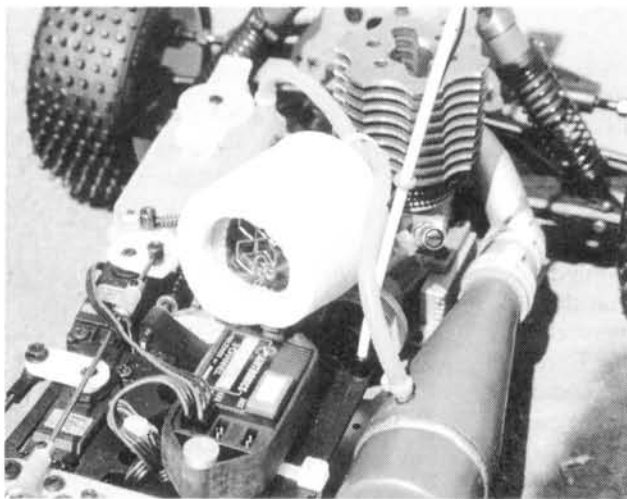


▲ For improved braking, add the optional Kyosho front brake kit and fiber-center brake disk. By mounting the steering servo from the bottom of the radio tray, you can connect both brakes with one rod instead of the two rods the instructions call for.

more cooling, an improved carburetor for more precise fuel metering and a bolt-on flange for the exhaust (to allow the use of more contemporary performance headers and pipes). I also use a Hayes* fuel filter to prevent impurities in the fuel from reaching the carburetor.

For the header and the pipe, I called on engine guru Ron Paris, who's well-known on the 1/8-scale on-road racing circuit as the authority on nitro-powered engines and exhaust systems. Ron provided me with a 180-degree header designed for in-line engines and one of his famous "quiet pipe," tuned, exhaust pipes. The AL-650 pipe is designed to give the engine the bottom-end horsepower that buggies require. The header and pipe are joined by another Paris product, the "Bullet-Proof Exhaust Coupler." Appropriately named, this tubing is virtually impervious to the heat that can claim inferior couplers in a matter of a few runs.

Protecting the engine from dirt and debris is K&N's* washable air filter, which uses an oiled cotton element to grab particles that are on their way to damaging the engine. This is the most free-flowing filter I've ever seen, and it can offer a significant boost in



◀ A K&N washable air filter improves air flow. To keep the oiled filter element from becoming caked with dust too quickly, foam from the stock O.S. air filter is glued at the ends and slipped over the K&N filter.

performance. An extra benefit is that it's washable, so when it gets dirty, you just hose it out instead of throwing it away. Just make sure that you re-oil it.

I attached one of Kyosho's special one-piece flywheels to the engine; it's much less likely to slip on the crankshaft than the stock two-piece flywheel. On older engines, this one-piece flywheel allowed dirt to enter the front engine bearing, and this led to damage, but the new RX-B has a rubber-sealed bearing to prevent that from happening. The flywheel is fitted with stock clutch shoes that I lightened by drilling three evenly spaced holes. This allows the clutch to engage at a higher rpm where the engine makes more power. An optional, 15-tooth, Kyosho hardened-steel clutch bell drives the car (it's available in 11- to 15-tooth sizes). It rides on special high-speed ball bearings that replace the stock needle bearing.

Mounting the RX-B engine requires special engine mounts that are available through Kyosho. These mounts are solid aluminum; I had them lightened at MK Engineering by having heat-sink fins cut into them.

I chose an Airtronics* 3P Caliber radio and some Airtronics monster servos that

Muise of Motion Graphics*. Although the paint scheme is somewhat subdued, the color combination and the quality of the work was outstanding.

DID IT WORK?

At the track, I filled the flip-top fuel tank with O'Donnell Racing's* 20-percent-nitro fuel, which is unsurpassed when it comes to performance and engine protection. This special blend of pure castor oil and high-quality methanol and nitro is recommended by some of the top racers in the world.

As you might have expected, the boost in the car's performance was quite noticeable. The new O.S. engine combined with the Paris header and pipe pumped out some serious ponies. The first test run was at the Kyosho World Challenge at the Hobbico headquarters in Champaign, IL. Though an illness prevented me from practicing, by the time I had sorted out the handling for the track, the car was running brilliantly. The front brake made braking in the turns more predictable and acceleration out of the turns exceptional.

The long and short of it? None of these modifications alone will tremendously improve how the car performs. It's the combination of mods, as insignificant as they may seem, that makes the overall difference.



The power combination for the Burns includes an O.S. RX-B engine, a Rex 180-degree header and a Paris Racing AL-250 tuned pipe. A Paris "Bullet-Proof" coupling joins the header to the pipe.

*Here are the addresses of the companies mentioned in this article:

Kyosho/Great Planes Model

Distributors, P.O. Box 4021, Champaign, IL 61824.

Schumacher Inc., 6302 Benjamin Rd., Suite 404, Tampa, FL 33634.

Paris Racing Products, 4524 Independence St., Chino, CA 91710.

MK Engineering, P.O. Box 216, Seymour, CT 06483.

Hobbico; distributed by Great Planes Model Distributors.

O.S.; distributed by Great Planes Model Distributors.

Hayes Products, 2610 Croddy Way, Unit A, Santa Ana, CA 92704.

K&N, P.O. Box 1329, Riverside, CA 92502.

Airtronics Inc., 11 Autry, Irvine, CA 92718.

Motion Graphics, 2645 Robert Arthur Rd., Westminster, MD 21157.

O'Donnell Racing, 10702 Hathaway Dr., Santa Fe Springs, CA 90670.

are ideal for 1/8-scale buggy racing. For the throttle, I chose the 94151 servo that has 75 ounce/inches of torque and a blistering .08-second transit time for super-quick throttle response. I graced the steering with the behemoth 94152 servo, which has a monster 105 ounce/inches of torque and a transit time of .12 second! A lot of servo power is required to turn the large, heavy wheels of the Turbo Burns at high speed, and I can't think of a better candidate than the '152.

Finally, covering the Turbo Burns is the stock body that was painted by Rich

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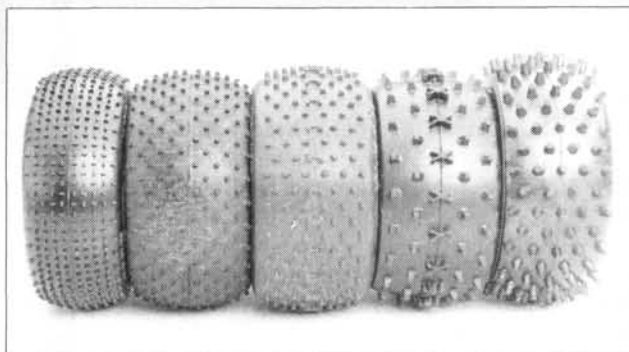
by BILL BACON

TIRE TECH

TREAD TALK: UNDERSTANDING OFF-ROAD TIRES

WHAT ARE the most important parts on today's off-road cars? Batteries? Motors? High-tech radio systems? No, no...the parts that I'm thinking of are, more often than not, overlooked—tires! Nothing is more critical to your off-road car's performance than the right tire combination; one that will "hook up" with the surface of the track on which you run.

I'm sure that many of you have had frustrating days when the right traction was nowhere to be found. A surprising number of racers look at everything but their tires



Off-road tires come in many compounds and with many tread designs, so choosing the right ones to suit specific track conditions can confuse even experienced racers.

to find a traction solution. Armed with the correct information, however, you can easily choose a "hot" tire setup.

Today, there are more tires offered for 1/10-scale off-road cars than for any other class. Although the number of choices seems staggering (there's a variety of tread patterns, rubber compounds, etc.), the tires basically fall into one of two groups—"tall"-pin spikes and mini-pin spikes. Each type is designed for a specific track condition; you just have to find the one that will provide your car with consistently good traction.

HEY! SPIKE, WHADDAYA LIKE?

There are many types of spike tires, and the number of spikes, as well as their length, shape and arrangement can affect a car's handling. For example, one of the newest types has a multitude of tiny pin-spikes molded into its surface. Unlike tall-spike treads, which tend to grip the sharp edges of a potholes and cause the car to flip, this tread allows the car to slide smoothly and predictably.

By carefully trimming the spikes on tall- and mini-pin spike tires, you can alter how the tires will affect a car's handling. Here are some ideas on how to modify these tires and how the modifications will affect performance. To show the characteristics of the tires themselves, I've concentrated on the rear tires and omitted the effect of the suspension setup.

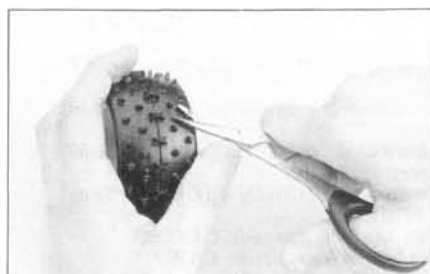
- On soft surfaces, e.g., loose sand or dirt, you don't have to trim the spikes, because they can dig into the surface completely.
- On hard surfaces, the spikes

may "fold under" rather than "dig in," and this will reduce traction. It can also cause the chassis to wobble under acceleration and reduce the car's stability on straightaways and out of turns. To prevent this, you should trim the spikes.

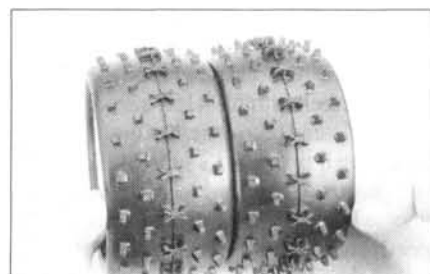
- When you use high-traction tires on high-bite dirt surfaces, your car's rear end can't slide outward, and this causes the car to "push" (understeer). To correct this, try cutting off a row of spikes completely. This will reduce traction and

enable centrifugal force (lateral G-Force) to swing the car's rear end outward and make it slide. This modification basically forces the car into an oversteering response.

- If your car has too much traction, the tires will overpower the motor, and this will drastically affect run times. Again, you should try cutting off a row of spikes completely. In addition to reducing traction, this will reduce friction on dirt surfaces.



If your tires' spikes don't completely penetrate the track's surface, or your car has too much traction, trim them with Lexan-body scissors or small clip-pers.



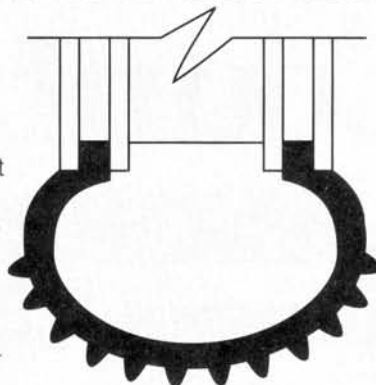
The tire on the left has been carefully trimmed; the tire on the right is untouched. Always trim your tires gradually until you achieve the desired handling characteristics.

A QUESTION OF CONTOUR

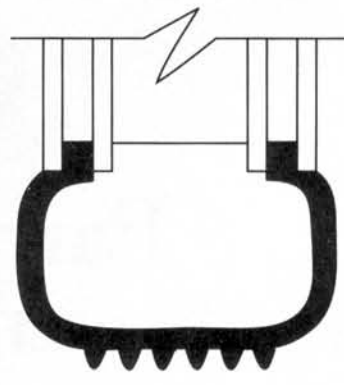
Off-road tires have two basic types of cross-sectional contour. One has a rounded surface, e.g., Pro-Line* PRO-80s or Jammin' Jay* Mini-Spikes, and the other has a flat surface, e.g., Schumacher* six rows or Losi* four rows.

The spikes on the shoulder of a round-contour tire don't touch the track as often as the central spikes. If, to decrease the tire's "bite," you cut the spikes off the shoulder, don't expect to improve your car's straight-line stability.

The shoulder on a flat-contour tire is sharply angled. This type of tire can be very unforgiving as far as potholes are concerned. Its shoulder spikes affect the car's straight-line stability. If you cut them off, you'll improve the car's "trace," i.e., it will feel more "locked in" and stable.



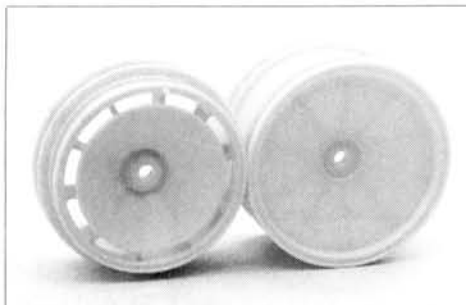
ROUND-CONTOUR TIRE



FLAT-CONTOUR TIRE

DIVING THROUGH THE LOOPHOLES

It's well-known that ROAR prohibits 2.2-inch rims. They're legal everywhere else in the world, however, and much of the European and Japanese R&D involves tires made for rims of this size. The ROAR rule was established to preserve the scale appearance of race cars, and because of it, U.S. racers are denied the right to use the superior tread designs being developed abroad. Enter Yankee ingenuity: using common, everyday rubber bands, you can mount these trick tires on ROAR-legal rims (i.e., those with a maximum bead-mounting diameter of 2.150 inches, measured where the internal tire bead meets the rim).



IFMAR rules allow 2.2-inch rims (right), but ROAR prohibits them. The maximum ROAR-legal rim diameter is 2.150 inches. Shown (left) is the standard 2-inch rim that's commonly used in the U.S.

To mount 2.2-inch tires on 2.150-inch rims, find some rubber bands that fit snugly on the mounting bead; they should be wide enough to provide the largest possible gluing surface. Stretch one around each rim, and glue them in place with the thinnest CA you can find. (Just run the CA along the edges of the rubber bands; this is usually sufficient to hold them.) When the rubber bands have been glued, check that the tires you plan to use fit properly. If they're still too large, glue on another set of rubber bands. Do this until the tires fit snugly, and then glue them to the rims in the usual way.



By gluing rubber bands to the inner mounting beads of ROAR-legal rims, you can use them with 2.2-inch tires. Just make sure the outside diameters don't exceed ROAR's 3.54-inch limit. Shown are Yokomo's latest 2.150-inch rims and tires for the Works '91 car.

Remember: it isn't the size of the 2.2-inch tire that gives you an advantage; it's their innovative tread designs and the rubber compounds they're made of. Also, ROAR specifies a maximum outside tire diameter of 3.54 inches, so don't exceed it, or your car will be considered illegal.

HOLEY ROLLERS?

At races, I've seen many drivers puncture several (three to five) holes in their tires. Why do they do this? Well, although tires are joined securely to the wheels when you've mounted them, there's always a slight air leak. As a result, when the tires go over big bumps, the air leaks out, the tires flatten momentarily, and the car may respond abnormally. To prevent this, you must find a way to force the air back into the tire quickly, and the space between the rubber and the wheel isn't enough. Puncturing the tire allows the air to enter as well as leave, and this helps to maintain the tire's original shape.

On the other hand, making holes in the rubber also increases the possibility that the tires will flatten too easily. Because many of today's tires have low profiles, i.e., low sidewalls, when the car runs over bumps and potholes, the insides of its tires hit the wheels abruptly, so the wheels have to absorb all the shocks. Shock is then transferred to the suspension, and this puts a lot of stress on the suspension parts. To solve this problem, many tire manufacturers offer "foam inserts" or "inner sponges." Since the tires can't absorb all of the shocks and it isn't good for the wheels (or the suspension!) to do so, putting inserts or sponges inside the tires helps. It also prevents the spikes from folding on hard surfaces, and that improves traction.



Off-road tires must be attached to the rims securely. Pull the tire onto the rim, pull up the mounting bead and apply CA (use the thinnest type available).



Even though the tire is glued to the rim, it still has some air leaks. To enable air to enter and exit the tire, puncture three or four holes in its face, or cut a small notch in the sidewall (shown).

Without the correct information, it's next to impossible to choose the proper tires for off-road racing. If you give all the factors that affect performance sufficient thought, however, you're guaranteed to come out on top. We hope, this article has helped to arm you with enough know-how to terrorize the local track!

*Here are the addresses of the companies mentioned in this article:
Pro-Line USA, P.O. Box 456, Beaumont, CA 92223.
Jammin' Jay Halsey Products, distributed by Team Losi, 13848 Magnolia Ave., Chino, CA 91710.
Schumacher Inc., 8302 Benjamin Rd., Ste. 404, Tampa, FL 33634.
Team Losi, see above.

NITRO NEWS

by JEFF BRONSTEIN

Engine ingenious

SO, YOU WENT out and bought that awesome new gas car—you know, the one with 4WD, three disk brakes, a two-speed transmission and a partridge in a pear tree!? Everyone you know owns at least one. You put the car together in one night, and you're fairly sure that everything's in the right place. The engine installation was straightforward enough, but how the heck does the engine work? No one told you that you'd have to learn a new set of rules, and this stuff about "strokin'" sure doesn't sound familiar! Whether it's an electric- or gas-powered car, it's important to understand how motors and engines work so that you can maximize their performance, diagnose problems, lengthen their useful life and minimize frustration.

ENGINE OPERATIONS

A 2-stroke engine's operation is deceptively simple. Although it has few moving parts, their interaction is extremely precise. The term "2-stroke" refers to the piston's two cycles—one down and

one up. As the piston moves downward from its uppermost position, it compresses the air/fuel mixture in the engine's case, and it uncovers an exhaust port in the cylinder liner. This allows spent exhaust to escape from the combustion chamber. A fraction of a second later, an intake port in the cylinder liner opens a bypass between the case and the combustion chamber, and this allows the new pressurized air/fuel mixture to enter. As it rushes in, it pushes the remaining exhaust out in a process called "scavenging." As the piston begins its upward stroke, it creates a vacuum in the engine case that pulls air and fuel through the carburetor. The intake and exhaust ports are closed off again as the piston re-covers them. When the piston reaches its uppermost position and the air/fuel mixture is compressed in the combustion chamber, a hot platinum glow-plug filament ignites the mixture and creates high-pressure gases that force the piston down again. An engine that can turn 25,000rpm will complete this process more than 400 times each second. If you're confused, don't worry. Some of R/C's best engine manufacturers still don't know exactly how it works—only that it does.

A GOOD THING MADE GREAT

Manufacturers do know that an engine's limitations are determined by the porting and timing of the crank and the cylinder lining. During the development of micro-engines, the accepted porting

method consisted of one intake and one exhaust port. Now, to maximize an engine's efficiency, it consists of several ports and bypasses. Multiple-bypass engines are commonly referred to as "Schnuerle-ported." By positioning the ports so that they'll open at different times, the engine's power band can be

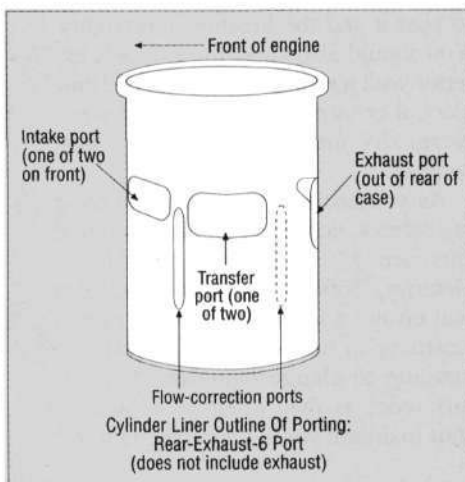


Although the piston, the cylinder, the connecting rod and the crankshaft aren't shown, here are the main components of the case and the carburetion system.

altered for different applications. A six-port is perfect for 4WD on-road, but may have too much low-end "punch" for 2WD. Don't assume that more horsepower will improve your lap times, though. A broader power band may make the car easier to drive.

For those with a real need for speed, modifying a stock engine's cylinder and crank can add even more punch. Paris Racing's* Ron Paris is a professional engine specialist who's known worldwide for his high-performance modifications to the popular Rex engines. By enlarging the exhaust port and altering the timing of the crank and intake ports, Ron makes his engines squeeze all the power out of each revolution. In addition, special backplates, connecting rods and heat-treated crankshafts prevent them from being blown apart at ex-

(Continued on page 136)



Transfer and flow-correction ports help to scavenge exhaust from the chamber as the new, cool fuel enters.

tremely high rpm. (Watch for tech tips and an interview with Ron soon.)

IT'S ALL IN THE MIXTURE

Modified or unmodified, an engine's combustion process is greatly affected by the air/fuel mixture. The ratio of fuel to air determines when the mixture will ignite and is controlled primarily by the needle-valve setting on the carburetor.

A mixture with too much fuel is called "rich." The extra fuel will carry off more heat, and this will cool the engine, but it will also prevent the glow plug from igniting the mixture properly. A rich engine will run roughly and will lack power. The opposite is a mixture without enough fuel—referred to as a "lean." A lean setting can cause extreme heat and wear, and it may result in severe damage. The small amount of fuel will burn quickly and may, in fact, be ignited prematurely, robbing the engine of power. A proper mixture will be ignited when the piston reaches its uppermost position, and it will produce the highest output.

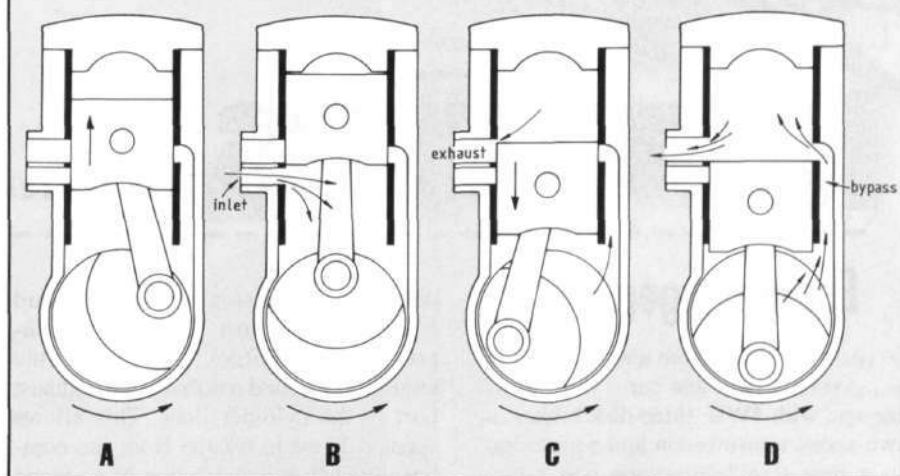
Setting the needle valve requires careful attention to the engine's tone and temperature. When you're sure that the fuel system is correct and that nothing is binding in the drive train, there are a few steps you can take to ensure that your engine will run properly. These steps apply to most 2-stroke engines.

At first, it's important to keep the engine fairly rich. If it's the first time that the engine has been started, run it



For extra performance, racers can buy Rex 21 racing engines that have been specially modified by none other than Ron Paris—a legend in 1/8-scale gas racing.

THE TWO-STROKE-CYCLE PRINCIPLE



● (A) piston rises—exhaust and bypass ports close; air/fuel mixture is compressed; inlet port about to open and admit mixture to crankcase where pressure has been lowered by rising piston. ● (B) piston at top of stroke—mixture (trapped between piston and cylinder head) is ignited and about to force piston down; fresh mixture enters crankcase. ● (C) piston approaches bottom of stroke—exhaust port opens to release gases; inlet port closes; fresh gas compressed in crankcase; bypass port to cylinder about to open. ● (D) piston at bottom of stroke—bypass port opens; fresh gases enter cylinder and help scavenge remaining spent gases out through exhaust port.

through at least two or three tanks of fuel at a rich setting to break in the moving parts.

Never try to tune a cold engine. When the engine has reached its operating temperature, close the needle slowly until the engine begins to gain speed and run smoothly. As you approach the proper setting, the engine will continue to run faster until it peaks. Never, *never*, run it at its peak rpm setting.

To provide adequate lubrication and cooling, the proper setting should always be slightly rich. If, after you've set the needle, the engine doesn't produce a slight trail of gray smoke when the car is running on the track, check its temperature; it may be overheating. Also check that the heat-sink head has sufficient ventilation. An engine that you can't touch very briefly is too hot! Even one lean run can permanently affect the engine's performance, so keep it cool, and keep it in one piece!

The "spit test" is one easy way to check the engine's temperature. By putting a little saliva on the engine head you can approximate the running temperature. If the saliva just sits on the head and bubbles slowly, the engine is too rich, and it will perform better if you close the needle slightly. On the other hand, if the saliva jumps around as if it's on a hot griddle, the engine is too lean, and you should immediately open the needle slightly. Ideally, the saliva will bubble a little and evaporate in about 2 or 3 sec-

onds. This indicates that the engine is running within the correct temperature range.

A "CLEAN" POLICY

To ensure that your engine has a long, reliable, useful life, take some simple precautions to keep it clean and dry. An engine's worst enemies are dirt and moisture. After racing, run all the fuel out of the tank and through the engine, then remove the air filter and blow any debris out of the element. To keep moisture out and prevent rust from developing inside, put a few drops of after-run or mineral oil into the carburetor and the exhaust. Turn the crank over a few times to coat it and the bearings thoroughly. You should also clean the engine's exterior with a small toothbrush and some alcohol or turpentine. Keep the car in a clean, dry area away from any heat sources.

As you become accustomed to these procedures, you'll see that gas-powered cars are as simple and reliable as electrics. Following a few basic rules will ensure a lot of trouble-free racing. Learning to use an engine is just like learning to charge batteries; the only difference is that when your buddies start to dump, you'll cruise right on by!

*Here's the address of the company mentioned in this article:

Ron Paris Racing/Rex Engines, 4254 Independence St., Chino, CA 91710.

NITRO 10

(Continued from page 102)

O'Donnell Racing, 10702 Hathaway Dr., Santa Fe Springs, CA 90670.

Team Losi, 13848 Magnolia Ave., Chino, CA 91710.

MK Eng., P.O. Box 216, Seymour, CT 06483.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

Hayes Products, 2610 Croddy Way, Unit A, Santa Ana, CA 92704.

SCOPING OUT

(Continued from page 58)

motor, fairly high gearing and fat tires, my Sideways hooked up to the pavement and was flying. My stopwatch indicated that we were geared for about 4-minute dumps.

A crowd soon gathered; everyone wanted to drive the car. A quick check at the end of a run revealed that the battery pack was very warm, the motor was too hot to touch, and the DTX-4 was also quite warm, but not hot enough to endanger it. The motor became so hot that it required a cool-down between runs.

Throughout this car-jamming session, the DTX-4 performed flawlessly. Accel-

(Continued on page 142)

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Overseas Distributors: G & M Trading - Australia, Keil - West Germany, Speed Connection - Ontario, Canada, Speedy Cars - France, Thor Racing - U.K., Hartley Brown - Alberta, Canada, Speed Tech - Singapore
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SCOPING OUT

(Continued from page 142)

Did I have any problems? Well, the instruction sheet that comes with the controller has no picture to show the DTX-4 connected to the rest of the car components; however, with a full set of factory-installed connectors and a careful reading of the instruction sheet, even a novice should be able to set it up properly. You'll notice a big improvement in performance if you hard-wire the motor (eliminate the motor connectors) and replace the Tamiya-style battery connector with Litespeed connectors.

While we're on the subject of warranties: my good friend Rick Chambers (owner of RC Hobbies here in Huntsville, AL) tells me that Hobbico stands behind its products better than any of the other manufacturers do. The company has always given his customers quick service, and it has bent over backward to honor warranties. So, there you have it: the DTX-4 is a well-built ESC that performs well. Couple this with its bargain-basement price and you have a "winning" speed controller.

*Here are the addresses of the companies mentioned in this article:

Hobbico/Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61824.

Litespeed, P.O. Box 4765, Spokane, WA 99202.

BALL DIFFS

(Continued from page 70)

velop flat spots that will greatly reduce the smoothness of the diff's operation. The best way to avoid these flat spots is to tighten the diff screw or nut gradually (about 1/4 to 1/2 turn at a time), and rotate the diff to reposition the balls each time you tighten the screw or nut.

It's virtually impossible to set a ball diff perfectly when it isn't installed in the car or truck for which it's intended. To get it "in the ballpark," however, grasp one of the outdrive halves and the main ball race firmly in one hand, and try to rotate the other outdrive half with your other hand. It should be difficult, if not impossible, to rotate. If it isn't, resume the process of tightening the adjustment screw or nut until it is. At that point, you can install the diff assembly in the vehicle.

To set the diff in a pan-car differential, secure the rear tires and grasp the spur gear, then try to rotate the gear; it should

(Continued on page 175)

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	6 Cell SCR	7 Cell SCR
• A-Main TQ, 1st Place		
1991 Cactus Classics / 2WD Stock		
• A-Main TQ, 2nd Place		
1991 Reedy Top Gun / 2WD Stock	280-289	24.95
• A-Main 2nd Place	290-294	29.95
1991 Twister Championship / 2WD Stock		30.95
• A-Main 1st Place	295-299	36.95
1991 NORRCA Off-Road Nationals / 2WD Pro-Stock	300-302	39.95
• A-Main 2nd Place	303-305	47.95
1991 Reedy Top Gun / 2WD Modified		44.95
• A-Main 4th Place	305 & UP	53.95
1991 ROAR Off-Road Nationals / 2WD Stock	Super Hi-Output	49.95
		58.95
		69.95

Super Hi-Output packs have extreme voltage output. Run time is not emphasized in these packs. We therefore recommend to use them in Off-Road and Truck-Pull only, where run time is not important.

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BALL DIFFS

(Continued from page 152)

be fairly—not overly—difficult. It isn't necessary to run an on-road car with its diff locked up, so a little slip is desirable.

Making the final diff adjustments in off-road cars is a little more complicated, and it's best to make them at the track. Do a series of take offs from a dead stop, and note the amount of wheel spin and slippage. A properly set differential should slip about 1 or 2 feet—no more. If it slips excessively, its life will be greatly reduced. The heat generated by a slipping diff will quickly overheat the unit and melt the plastic that many diff gears and pulleys are made of.

FINI

A properly built and adjusted ball diff is the nucleus of a high-performance R/C race car, and it will add to your enjoyment of non-race cars, too. Careful attention to the diff's assembly and adjustment will result in a car that accelerates quickly and corners sharply. So, take your time and pay attention to the details—they aren't as small as you may think! ■

FLY'N "M"

(Continued from page 80)

mounted the spare tire rack to the trailer with servo tape, coupled the trailer to the cab and the rest is history!

This kind of effort deserved some recognition, so I brought the entire rig to a paved-oval event sponsored by New England Radio Control Auto Racing of Enfield, CT. When the ballots were counted, there was no doubt about the winner. If you have some spare time, and you're looking for something special, I suggest that you check out the Fly'n "M" 18-wheeler.

"Breaker, breaker, good buddy! See ya at the checkered line..."

*Here are the addresses of the companies mentioned in this article:

McAllister Racing, 1000 N. Humphreys St., Suite 204, Flagstaff, AZ 86001.

Pro-Line USA, P.O. Box 456, Beaumont, CA 92223.

Pactra Inc., 620 Buckbee St., Rockford, IL 61104.

Autographics of California, 7401 White Ln. #1, Bakersfield, CA 93309.

Dremel, 4915 21 St., Racine, WI 53406.

RAM, 4736 N. Milwaukee Ave., Chicago, IL 60630.

Dean's Connectors, distributed by Ace R/C, 116 W. 19 St., Box 511C, Higginsville, MO 64037.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

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LYNX II ELITE SS

(Continued from page 89)

in all, it was a fairly simple matter of adjusting the rear sway bar to increase steering response. Even with the massive horsepower I was running, the Lynx SS was predictable and controllable—not bad for its first outing.

SUMMARY

Just when you thought you had seen it all, TRC/Composite Craft introduced the Lynx II Super Speedway. The stakes keep going up in the 1/10-scale, high-speed, oval-racing game, and this car is definitely on top of the heap. It's difficult to say whether the Lynx is over-engineered—if such a thing is possible—because although there's no argument that the car works, it's still a fact that many so-called "simply designed" cars consistently run with and sometimes beat the Lynx. But for sheer "trickiness," the Lynx SS gets my vote. It just takes a little more thought to understand the multitude of adjustments one can make to the car, and how each will affect handling.

(Continued on page 182)

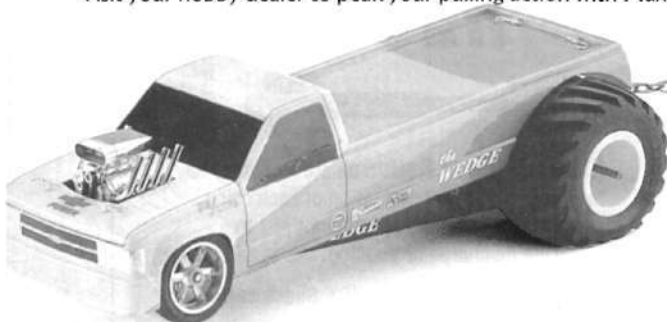
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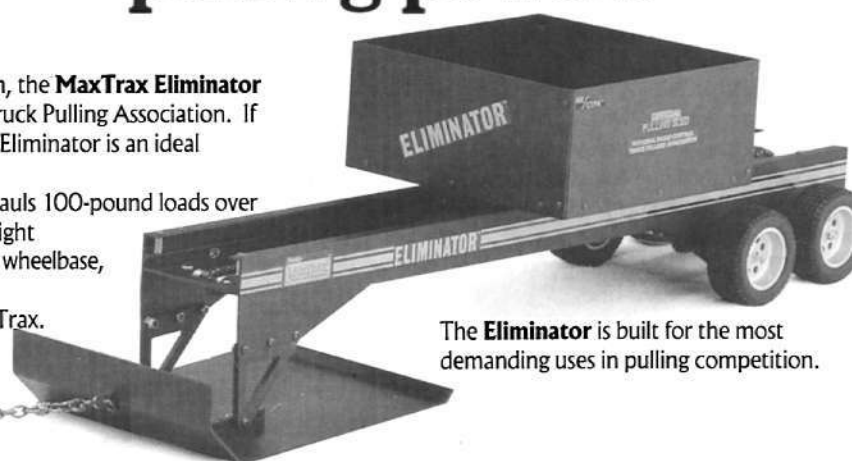
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GETTING STARTED

(Continued from page 182)

the R/C racer needs. Pinion-gear caddies keep your gear collection organized by size, so you don't have to count those tiny little teeth. Work stands and chassis vises hold the car securely, and motor vises hold the motor so that wire soldering, cleaning and other maintenance can be performed more easily. Protective bumpers keep you from damaging front-end parts in a crash. The pros don't use them, but they aren't a bad idea for beginners. Maybe you'll get one of these items as a present if you throw out enough hints.

*Here are the addresses of the companies mentioned in this article:

Airtronics Inc., 11 Autry, Irvine, CA 92718.

Altech, P.O. Box 391, Edison, NJ 08818.

Cox Hobbies Inc., 350 W. Rincon St., Corona, CA 91720.

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KO Propo, distributed by Global Hobbies Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728.

Kyosho/Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61824.

MRC/Tamiya, 200 Carter Dr., Edison, NJ 08817.

Alpina/JR Radio, distributed by Hobby Dynamics Distributors, P.O. Box 3726, Champaign, IL 61826.

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Panasonic, P.O. Box 1511, Secaucus, NJ 07094.

Gates Energy Products, P.O. Box 861, Gainesville, FL 32602.

Aerotrend, 31 Nichols St., Ansonia, CT 06401.

Royal Products Corp., P.O. Box 5026, Denver, CO 80217.

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(Continued on page 194)

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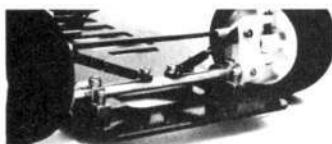


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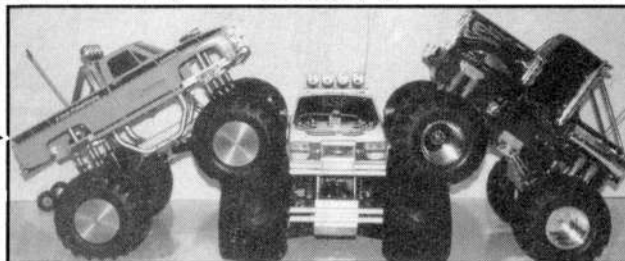
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(Continued from page 191)

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Traxxas Corp., 12150 Shiloh Rd. #120, Dallas, TX 75228.

LETTERS

(Continued from page 11)

ON YOUR MARK, GET SET...

I'm a newcomer to this sport. I got my first issue of *Radio Control Car Action*, and I loved it—it's awesome. I was wondering,

I've thought about getting the Kyosho Raider or the MRC/Tamiya Grasshopper. What do you suggest?

DAN ARMSTRONG
Olney, IL

We're glad you like the magazine, Dan, and both of the cars you've mentioned are excellent for beginners. The Raider, however, has independent suspension, and this enables it to perform slightly better than the Grasshopper, which has a rigid rear axle.

Both cars come with mechanical speed controllers, so all you'll need is a 2-channel radio system, a battery pack and a quick charger.

FM

CORRECTIONS

In the November '91 "Letters," we mistakenly wrote that the Novak 410-M5 could only handle motors of 16 turns or more. As John Rist showed in "Scoping Out" in the same issue, the 410-M5 can handle powerful modified motors and up to seven cells and still run like a champ.

Also in the November issue, the price for the Team Smooth 6-cell battery pack listed in "Battery Blowout" is incorrect: the correct price is \$87, which calculates to 3.82 seconds per dollar.

We apologize for any inconveniences these errors might have caused.

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Fast Lane, 25845 San Fernando Rd., #21, Saugus, CA 91350; (805) 255-2404



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Rental Raceway, 3655 S. Hopkins Ave., Titusville, FL 32780; (407) 383-0631



St. Augustine R/C Speedway, 99 Masters Dr., St. Augustine, FL 32095; (904) 824-6357



Sun Valley Speedway, Palmer Blvd., Sarasota, FL 34232; (813) 322-1200; (mailing address: Rt. 1, Box 443N, Myakka City, FL 34251)



West Coast R/C Club, Lake Park, 8607 May Cr., Tampa, FL 33614; (813) 932-3650



Wilbur Avenue Raceway, 1848 Wilbur Ave., Vero Beach, FL 32960; (407) 567-1200



GEORGIA

Case R/C Raceway, P.O. Box 1061, Trenton, GA 30752; (404) 657-6789



Dalton Raceway, 2300 Chattanooga Rd., Dalton, GA 30720; (404) 226-6699



Georgia Hobby Center, 112 Kenwood Rd., Fayetteville, GA 30214; (404) 460-1753



Good Life City Raceway, 6606 Newton Rd., Albany, GA 31707; (912) 888-2515



Peach Bowl R/C Speedway, 2035 Westside Ct., Snellville, GA 30278; (404) 985-1448



The Racer's Edge, 1530 Hwy. 19 North, Thomaston, GA 30286; Mark or Roger Walls, (404) 648-6534



Sandy Cross Speedway, Rt. 1, Box 1073, Royston, GA 30662; Morris Phillips or Wayne Fowler, (404) 245-9573



Silver Wings Raceway, 5611 Riverdale Rd., College Park, GA 30349; (404) 991-2225



IDAHO

Falls Hobbies & R/C Raceway, 1515 Northgate Mile, Idaho Falls, ID 83401; (208) 529-8650



ILLINOIS

Ameri-Trac, R3, Box 242, Mattoon, IL 61938; (217) 234-8707



Badlands II, 320 W. Jackson St., Vandalia, IL 62471; (618) 283-2913



B.A.R.R., 809 River Dr., Byron, IL 61010; Jim Haynes, (815) 234-5615



Eagle Speedway, 303 N. Plum St., Pontiac, IL 61764; (815) 842-1738



Hobby Town Raceway, 4915 W. Rt. 120, McHenry, IL 60050; Mike Hollingsworth (815) 344-1777



JC Hobbies/Metro Motor Speedway, Metropolis Airport, Metropolis, IL 62960; (618) 524-9979



JMP Raceway, 952 Harrison Ave., Wood River, IL 62095; (618) 258-0297 or -0282



Leisure Hours Hobbies, 2872 Plainfield Rd., Joliet, IL 60435; (815) 439-1477



Lisle Community Park Raceway, 1825 Short St., Lisle, IL 60532; (708) 416-6944 (Jim Bernicky)



Machesney Park, 1220 Shappert Dr., Machesney Park, IL 61111; (815) 282-1311



Magnum R/C Speedway, RR#2, Box 399, Danville, IL 61832; Terry & Nancy Dines, (217) 446-2472



Monee R/C Raceway, 26049 Ridgeland Ave., Monee, IL 60449; (708) 534-2422



R/C Speed Zone, 1400 E. Lafayette, Bloomington, IL 61701; (309) 662-RACE



Redline Raceway, 921 Harding, Calumet City, IL 60409; (708) 862-8181



SIRCAR Raceway, 1200 North Marion, Carbondale, IL 62901; (618) 549-5885



Slot Wing Hobbies Race Place, 1615 W. Springfield, Champaign, IL 61821; (217) 359-1920



Smithton Community Park, P.O. Box 8152, Belleville, IL 62221; (618) 236-7569



Superior Raceway, 1706 W. Bradley, Champaign, IL 61821; (217) 359-8073



Thunderroad Speedway, 5 W. Division St., Coal City, IL 60416; A. Cooley, (815) 634-8184



Valley Farms R/C Raceway, 706 By-pass 20, Cherry Valley, IL 61016; (815) 332-4516



INDIANA

BJ's Riverside Raceway, 265 S. Clay St., Jasper, IN 47546; Joe Lorey, (812) 482-3484



Blaze'n Race'n, P.O. Box 6, Hamlet, IN 46532; James Berndt, (219) 867-1324



Boone County R/C Track, 1300 E. 100 S. Rd., Lebanon, IN 46052; Jerri Moss, (317) 293-2225



CC Hobby & Speedway, RR 1, Box 68, Francesville, IN 47946; (219) 567-2447



Gonzo Raceway, 418 Roberts Rd., Chesterton, IN 46304; (219) 980-8409



Hobby Barn Raceway, 1950 Springhill, Terre Haute, IN 47802-9694; (812) 299-5773



K&L Hobbies, 7 Raceway, 2751 N. State Rd. 39, La Porte, IN 46350; (219) 324-0353



Mooreville R/C Hobby, 7 Moore St., Mooreville, IN 46158; (317) 831-8877



Mooreville R/C Hobby, 9201 S. State Rd. 67, Camby, IN 46113; (317) 831-8877



PITT, 1244E 700N, Ossian, IN 46777; (219) 622-4591



R/C World of Indiana, RR #2, Box 335, Lynn, IN 47355; (317) 874-2464



Radio Car Craft, 1925 S. Curry Pike, Bloomington, IN 47403; (812) 332-3245



IOWA

Mr. Car Raceway, Central Iowa Fairgrounds, Marshalltown, IA 50158; (515) 483-2234



North Park R/C Speedway, 805 S. Jerome, Algona, IA 50511; (515) 295-9352



Plymouth County R/C Speedway, 4th Ave. NE (Plymouth County Fairgrounds), LeMars, IA 51031; (712) 546-8788 or -9522



Power House Racing, 1200 S. Division St., Creston, IA 50801; (515) 782-4582 or 782-4174



Rotunda Raceway, 101 Bass, RR 1 Box 155A, Storm Lake, IA 50588; (712) 732-4555



Sibley Raceway, Osceola County Fairgrounds, Sibley, IA 51249; Al Reck (712) 754-2604 (day) or 754-3613 (night)



Southwest Iowa R/C Raceway, Kelly Park, Red Oak, IA 51566; (712) 623-5513



KEY TO SYMBOLS

- Indoor
- Outdoor
- Off-road
- Oval
- Dirt oval
- Carpet
- Concrete
- Asphalt
- On-site hobby shop
- AC power
- Automatic lap-counting
- Food available

Track Directory

Southwest Iowa R/C Raceway, Montgomery County Fairgrounds, Red Oak, IA 51566; (712) 623-5513



Team Johnson Speedway, Jct. Hwy. 34 & 406, West Burlington, IA 52655; (319) 753-0753



KANSAS

Chad's R/C World & Raceway, 217 Brownie Ave., P.O. Box 76, Scranton, KS 66537; (913) 793-2313



Pittsburg International Mini Speedway, 511 1/2 N. Locust, Pittsburg, KS 66762; (316) 232-1973



R/C Superdome & TQ Pro Shop, 14 East Avenue A, Hutchinson, KS 67501; (316) 665-6633



Spring Creek Raceway, 7257 W. Cloud St., Salina, KS 67401; (913) 823-8992



KENTUCKY

Bluegrass Int'l/Perry's R/C Hobbies, 214 Globe St., Radcliff, KY 40160; William Perry, (502) 351-RACE



Fast Lane Hobbies, 6132 Scottsville Rd., Bowling Green, KY 42104; (502) 782-2419



The Lexington Autodrome Raceway, 2753 Richmond Rd., Lexington, KY 40509; (606) 269-7794



Remote-Control Hobby Shop/Raceways, Rt. 8, Box 211, Mayfield, KY 42066; (502) 247-4715



LOUISIANA

Acadiana R/C Hobbies & Raceway, 120 Toledo Dr., Lafayette, LA 70506; (318) 235-5825



Cajun R/C Raceway, Rt. 2, Box 288 Hwy. 343, Church Point, LA 70525; (318) 873-3855



The Hobby Shop Track, 110A Darbonne, Sulphur, LA 70663; (318) 527-9129



Oakdale Raceway, 1259 Hwy. 165 S., Oakdale, LA 71463; M.L. Jeziorski, (318) 335-3532



MAINE

Central Maine R/C Speedway, 18 Lithgow St., Winslow, ME, 04901; David Prescott, (207) 877-2232



Rocket R/C Hobbies, Annabessacook Rd., Winthrop, ME 04364; (207) 377-6910



Team Terminator Off-Road Track, c/o Hobbies Plus, 479C Elm St., Biddeford, ME 04005; (207) 282-8838



The Racers' Club, 85 Hubbard Rd., P.O. Box 160, Berwick, ME 03901; (207) 698-5337



MARYLAND

Cliff's R/C Raceway, 4727 Conowingo Rd., Darlington, MD 21034; Doug, (301) 538-3135



Doug's Hobby Shop Raceway, Rt. 301N, Box 32B, Waldorf, MD 20601; (301) 843-7774



Friendship Off-Road Racers, 1531 Florida Ave., Severn, MD 21144; (301) 551-3050



GPA Speedway, 3498 Crain Hwy., Bowie, MD 20715; George Cole, (301) 805-9004



Off-Road Headquarters Indoor Raceway, 5640 K Sunnyside Ave., Beltsville, MD 20705; (301) 474-1246



Suzie Goose Hobbies, 718 E. Gude Dr., Rockville, MD 20850; (301) 279-2966



MASSACHUSETTS

Archer's Lane R/C Raceway, 11B Washington St. (Rt. 1), S. Attleboro, MA 02730; (508) 399-6762



CKS Raceway, 46 Wilbraham St., Palmer, MA 01069; (413) 283-2260



Megadrome Raceway, North Adams Plaza, Rt. 8, North Adams, MA 01247; (413) 743-7223



Mike's Speedway, Rt. 9, Mt. Farms Mall, Hadley, MA 01035



R/C Hobbies & Speedway, 1311 Purchase St., New Bedford, MA 02740; (508) 991-5040



West St. Hobbies, 114C Main St., Medway, MA 02053; (508) 533-1231



MICHIGAN

Baja Bayou Off-Road Raceway, 5313 West 22 Mile Rd., Tustin, MI 49688; (616) 829-3447



Can-Am Hobbies Speedway Park, 1148 Gratiot, Marysville, MI 48040; (313) 364-3338



Cereal City R/C Off-Roaders, 2000 E. Columbia Ave., Battle Creek, MI 49015; (616) 963-2506



Fun Tyme High Banked Oval, Fun Tyme Adventure Park, 6295 E. Saginaw Hwy., Grand Ledge, MI 48837; (517) 655-5503



Jonimo Hobby & Raceway, 27788 Joy Rd., Livonia, MI; (313) 422-1830



Ludington R/C Raceway, 1483 N. Dennis Rd., Ludington, MI 49431; (616) 843-4654



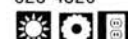
Mason County R/C Car Track, West Shore Community College, Scottsville, MI; (616) 843-8553 or -4837



More R/C Club, 33538 23 Mile Rd., Chesterfield Township, MI 48047; Tom Kelly, (313) 773-5918, or Joe, 749-9774



Off-Road Speedway, 1940 Lakeville Rd., #28, Oxford, MI 48371; (313) 628-4320



R&L Hobbies, 10334 Portage Rd., Portage, MI 49002; (616) 323-3686



R.G. Enterprises, 600 N. Lafayette, Greenville, MI 48838; (616) 754-4919



Rider's Superspeedway, 42040 Koppernick, Suite 400, Canton, MI 48187; Brent Martin, (313) 451-5599



Rider's Superspeedway, 4415 S. Westnedge, Kalamazoo, MI 49008; Ken Penn (616) 349-2666



USA Raceways, 6083 Dixie Hwy., Bridgeport, MI 48722; (517) 777-7USA



MINNESOTA

Wild West R/C Speedway, 2822 Piedmont Ave., Duluth, MN 55811; Roger Deloach, (218) 722-6248



Minn-E-Golf & Hobby, 9100 Park Ave., Elk River, MN 55330; (612) 441-8365



MISSISSIPPI

Norm's R/C Hobbies, 310 E. Beach Blvd., Long Beach, MS 39560; (601) 863-0524



Precision Hobbies, 240 Eisenhower Dr., Biloxi, MS 39531; (601) 388-6346



Small Cars Unlimited, 820 Cooper Rd., Jackson, MS 39212; (601) 372-FAST



MISSOURI

Doug's Hobbies, 5221 Veil of Tears, Jefferson City, MO 65109; (314) 893-5861



Harrisonville Hobby Shop & Raceway, 2301 S. Commercial, Harrisonville, MO 64701; Richard Taylor, (816) 887-3055



Outback Speedway & Hobby, 2810 Sutton Blvd., Maplewood, MO 63143; (314) 644-3383



R + Hobby, 590 Jungermann Rd., St. Peters, MO 63376; (314) 928-9838



Bozeman R/C Powerhouse Track, west side of the Main Mall, Bozeman, MT 59715; (406) 586-6461



Garden City Raceway, 6725 Hwy. 10 West, Missoula, MT 59802; (406) 721-5405



Magic City R/C Raceway, 14th St. W. & Central Ave., Billings, MT 59101; (406) 259-9004



NEVADA

Little City Hobbies Raceway, 640 Kuenzki, Reno, NV 89503; Gregg Allen, (702) 786-3611



NEW HAMPSHIRE

4-K Racing, 100 Warwick Rd., Winchester, NH 03470; (603) 239-6207



C.T. Hobbies R/C Raceway, 49 Eaton Rd., Auburn, NH 03032; (603) 483-2274



Hobbies Plus R/C Raceway, 14 Celina Ave., Nashua, NH 03063; (603) 882-9200



Hobby Etc., Heritage Place, Rt. 101A, Amherst, NH 03031; (603) 595-8549



R&B Racing, Lily Pond Rd., Gilford, NH 03246; Louie, (603) 524-2909 or Bud (603) 524-1893



NEW JERSEY

Action Raceway & Hobby Center, Rt. 295 & Harmony Rd., Gibbstown, NJ 08027; (609) 423-8933



Glassboro's Grand Oval Speedway, 167 S. Delsea Dr., Glassboro, NJ 08028; (609) 863-1551



Hopewell R/C Speedway, 138 West Broad St., Hopewell, NJ 08525; (609) 466-2715



Jackson R/C Racing, Marshall Ave., Jackson, NJ 08527; (908) 905-1593



L.B.R.A. Track, 392 Warburton Pl., Long Branch, NJ 07740; (908) 222-5122



The Race Place, Rt. 33 & 34, Farmingdale, NJ 07727; (908) 938-5215



Radical Raceway & Hobbies, 100 Rt. 17S, Lodi, NJ 07644; (201) 834-6996



Tri-Oval Speedway & R/C Center, 296 S. Main St., Phillipsburg, NJ 08865; (908) 454-2223



Truck Challenge, 1162 Rt. 202-206N., Bridgewater, NJ 08807; Michael Gill, (908) 658-9616



Zeppelin Hobbies, 92 Rt. 23N, Riverdale, NJ 07457; Lou Ballini, (201) 831-7717



NEW MEXICO

Racers Inn, 4300 Rankin Ln. NE, Albuquerque, NM 87107; (505) 345-5988



NEW YORK

A&D's FasTracks, 1000 N. Main St., Brewster, NY 10509; (914) 279-2065



A&S Race Center & Hobbies, 120 Cayuga St., Canalview Mall, Fulton, NY 13069; (315) 598-2772



Bellmore Raceway, 2479 Charles Ct., Bellmore, NY 11710; (516) 783-3456 or 783-0105



Brockport Speedway, 6000 Sweden Walker Rd., Brockport, NY 14420; Gil & Betty Glidden, (716) 637-6224



Cars R/C & Guitars, 4360 Seneca St., West Seneca, NY 14224; (716) 674-0905



Central New York R/C Auto Racers, Martin St., P.O. Box 116, Rome, NY 13440; John Orr, (315) 336-5140



Chipmunk Hill R/C Speedway, 217 Pine St., Theresa, NY 13691; Ted House, (315) 628-5065



Dirt Track, 17 Fairway Dr., Manorville, NY 11949; Billy Wroblewski (516) 878-0737



East End Off-Roaders, Route 25A at Gull's Square, Wading River, NY 11792; (516) 929-8844



KEY TO SYMBOLS

- Indoor
- Outdoor
- Off-road
- Oval
- Dirt oval
- Carpet
- Concrete
- Asphalt
- On-site hobby shop
- AC power
- Automatic lap-counting
- Food available

Track Directory

Eliminator Raceway, 125 Vermont Ave., North Babylon, NY 11703; Jim, (516) 321-6730



Island Hobbies & Raceway, 410 Commack Rd., Deer Park, NY 11729; (516) 254-6229



Lakeside Raceway & Hobbies, 712 Willow Ave., Ithaca, NY 14850; (607) 272-0248



Latest Hobbies & Raceway, Rt. 25A, Wading River, NY 11792; (516) 929-8844



LI 1/4-Scale Racers, 63 Horton Dr., Huntington Station, NY 11746; (516) 351-5384



Maspeth Raceway, Rust St. & 57th Rd., Maspeth, NY 11378; (718) 894-0800



Queens Off-Roaders, 42-12 13th St., Long Island City, NY 11101; (718) 392-5766



R/C Competition Corner, K-Mart Plaza, Mattydale, NY 13211; (315) 455-8718



R/C Hobbies, Rt. 49, Box 138, Constantia, NY 13044; (315) 623-9536



R/C Speedway & Hobbies, 1555 State St., Watertown, NY 13601; Steve Pena, (315) 788-1320



Riverside R/C & Hobby, P.O. Box 125, Rt. 126, Beaver Falls, NY 13305; (315) 346-1682



Russet's R/C Racetrack, 1793 Ridge Rd., Ontario, NY 14519; (315) 524-2522



Schenectady R/C Speedway, 955 State St., Schenectady, NY 12307; (518) 370-3747



Schoharie Co. R/C Car Club, P.O. Box 126, Cobleskill, NY 12043; (518) 234-4600



Skaneateles Raceway & Hobby, P.O. Box 102, Rt. 20, W. Genesee St., Skaneateles, NY 13152; (315) 685-8077



South Shore Hobby & Raceway, 311 W. Roe Blvd., Patchogue, NY 11772; Don Hauck, (516) 758-5567



Wall's Hobby, 2 Dwight Park Dr., Syracuse, NY 13209; (315) 453-2291



Western New York R/C Speedway, 58 Spring St., Cuba, NY 14727; Jason Congdon, (716) 968-3586



NORTH CAROLINA

C&H Raceway, 1400 N. Cannon Blvd., Kannapolis, NC 28081; (714) 933-5321



Cape Fear Speedway, 107 Harley Rd., Wilmington, NC 28401; (919) 762-1184



Carolina R/C Drag Assoc., 907-C Warsaw Rd., Clinton, NC 28328; (919) 592-9489



Charlotte R/C Raceway & Hobbies, 5820 Old Concord Rd., Charlotte, NC 28213; (704) 597-0608



Granite City R/C Raceway, 192-1 N. Main St., Mt. Airy, NC 27030; (919) 786-1466



Hi-Performance Hobbies & R/C Raceway, P.O. Box 320, Earl, NC 28038; Derrell Hollifield, Steve Bliss, (704) 482-4391



Jacksonville International Speedway, Hwy. 17N, Jacksonville, NC 28540; (919) 346-1522



Joe's Hobby Shop & Raceway, Rt. 2, Box 682-B, Bessemer City, NC 28016; (704) 435-2912



Mountain R/C Raceway, Hwy. 107N, P.O. Box 67, Glenville, NC 28736; (704) 743-3709



Reedy Creek Raceway, Rt. 14, Box 946, Conard Sowers Rd., Lexington, NC 27292; (704) 731-4022



Sandhills Raceway, Inc., US #1 South, Aberdeen, NC 28315; (919) 944-7414



Smiley Face Raceway, 120 W. Center St., Mebane, NC 27302; (919) 563-3822



TLC R/C Raceway, Rt. 6, Box 321-A, Hwy. 601, Mocksville, NC 27028; (704) 492-7569



NORTH DAKOTA

Crystal Springs Off-Road, 1200 53 Ave. SW, Minot, ND 58701; (701) 852-9590



OHIO

Aircraft's R/C Raceway, 1370 Custer-Orangeville Rd., Brookfield, OH 44403; (216) 448-1573



Classic Hobbies & Raceway, 2845 W. Waterloo Rd., Akron, OH 44312; (216) 628-8427



CRC Raceway/Toy Train Hobbies, 1015 Lower Bellbrook, Xenia, OH 45385; (513) 372-6806



Hi-Tech Hobbies II, 116 Taylor St., Loveland, OH 45140; Rick Lewis, (513) 683-8900



Hobby Mania Raceway, 6597 Route 224, Lowellville, OH 44436; (216) 536-8282



Innovative Hobbies/Lakeside Speedway, 3427 Manchester Rd., Akron, OH 44319; (216) 645-1333



KAR R/C Raceway, 14511 Seacrest Rd., Salem, OH 44460; (216) 537-4039



Mid-Ohio R/C Raceway, 5367 Fishburg Rd., Huber Heights, OH 45424; (513) 233-2807



Way Out Hobbies, 5583 Centerpoint Rd., Georgetown, OH 45121; (513) 375-4984



Y-City Hobby & Speedway, 120 S. 6th St., Zanesville, OH 43701; Kevin McKenna, (614) 455-3025



OKLAHOMA

Off-Road R/C Autos of Tulsa, 13349 E. 11th #B, Tulsa, OK; (918) 251-5592



OKC Raceway, 6707 NW 10th, Oklahoma City, OK; (405) 495-4820



RCRC of Oklahoma, 400 S. Vermont, Suite 104, Oklahoma City, OK 73108; Robert Jones, (405) 942-RCRC



OREGON

Buggy Boogie Race Track, Rt. 4, Box 546, Astoria/Knapka, OR 97103



Ed's Dirt Speedway, 2809 N. Cherry St., La Grande, OR 97850; (503) 568-4332



R/C Plus Hobbies Raceway, 2029 25th St. SE, Salem, OR 97302; (503) 364-9188



R/C Speed Center, 2810 N. Pacific Hwy., Medford, OR 97501; (503) 779-8298



PENNSYLVANIA

Brian's Raceway, 733 Flexer Ave., Allentown, PA 18103; (215) 435-1862



Clearfield R/C Car Club, P.O. Box 297, Clark Hill Rd., Hyde, PA 16843; Joe Welch (814) 765-3045



Cressona Mall Speedway, Rt. 61, Pottsville, PA 17901; (717) 385-3506



East St. Raceway & Art Center, 747 E. Railroad Ave., Verona, PA 15147; (412) 826-0602



High-Tek Hobbies Raceway, 13250 Rt. 30, North Huntingdon, PA 15642; (412) 864-5278



Koontz's Home & Hobby Center, 1205 Hoover St., Pittsburgh, PA 15204; (412) 331-3866



L&R R/C Racing, 15 S. Main St., Red Lion, PA 17356; (717) 244-1108



Modellbahn Ott Hobbies, 1145 E. Philadelphia Ave. (Rt. 73), Gilbertsville, PA 19525; (215) 367-5925



Performance Hobby, 1305 Main St., Slatington, PA 18080; (215) 760-9855



Prop & Wheels Raceway, 139 W. Broadway, Tamaqua, PA 18252; (717) 668-2288



Radio Controlled Pro Speedway, Rt. 487N, Stillwater, PA 17878; (717) 387-0266



Riverside Raceway, PA Ave. W & Hickory, Warren, PA 16365; Jeff Frailey, (815) 723-4211



T&T Radio Controlled Racing, Randolph Rd., Great Band, PA 18821; (607) 723-9357



TC's R/C's, 1537 Freeport Rd., Natrona Heights, PA 15065; Tom Coriale, (412) 226-1133



Wagonhill Hobbyland, RD3, Box 183, Slippery Rock, PA 16057; (412) 458-4711



RHODE ISLAND

East Bay Hobbies, 629 Metacom Ave., Bristol, RI 02809; (401) 254-0778



R/C Hobbies, 47 Sandybottom Rd., Coventry, RI 02816; (401) 823-4335



SOUTH CAROLINA

Berea R/C Speedway, 707 Sulphur Springs Rd., Greenville, SC 29611; (803) 246-4702



Inland R/C Speedway, 61 New Found Ln., Myrtle Beach, SC 29577; (803) 293-1753



LB Co. Hurricane, 112 Green Acres Rd., Blythwood, SC 29016; (803) 786-0984



Palmetto Raceway, 5023A Rivers Ave., N. Charleston, SC 29418; (803) 566-0068



TBS Superspeedway, Hwy. 151, Darlington, SC 29532; (803) 395-1551 or 332-7117



TBS Superspeedway, 800 Hwy. 15N, Hartsville, SC 29550; Johnny Tiller, (803) 332-7117



SOUTH DAKOTA

Dakota Off-Road Racers, 2989 W. Br. Co. 12, Aberdeen, SD 57401; (605) 226-0604



TENNESSEE

D&M's Downtown Raceway, 8 North White St., Athens, TN 37303; (615) 745-4288



The Dirt Dome, 575 W. Poplar Ave., Memphis/Collierville, TN 38017; (901) 853-3428



Tuckasee Off-Road Raceway, 1104 Lafayette Rd., Clarksville, TN 37042; (615) 645-2635



TEXAS

AA Raceway, 1617 Toomey Rd., Austin, TX 78704; (512) 474-8277



Austin R/C Center, 9702 Gray Blvd., Austin, TX 78758; Caton Cobb, (512) 832-8144



Budget Raceway, RR 1, Box 400 I-35, Bruceville, TX 76630; (814) 859-5296



Checkered Raceway, 8100 Kirkwood, Houston, TX 77072



Finish Line Hobby Store & Raceway, 11925 Jones Maltsberger, San Antonio, TX 78016; (512) 491-0088



Hal's R/C Raceway, 1440 Bessemer, El Paso, TX 79936; (915) 591-2213



Hi-Tech Hobbies, 1107 Port Neches Ave., Port Neches, TX 77651; (409) 724-2391



Indy R/C World, 220 Mesquite Village, Mesquite, TX 75150; (214) 686-7744



Norm's R/C Hobbies & Raceway, 2551 Lombardy, Suite 160, Dallas, TX 75220; Norm Mazzola, (214) 357-3453



R/C Pro Shop, 3303 N. Midkiff, Midland, TX 79705



Spring Creek R/C, 45 Fisherman's Rd., San Angelo, TX 76904; (915) 944-3850



TK's R/C Park, 2921 Old Claude Hwy., Amarillo, TX 79101; (806) 622-0017



Z Track, 1550 Dunnam Dr., Abilene, TX 79602; Chi Chi, (915) 692-8477



Track Directory

UTAH

Intermountain R/C Raceway, 8481 W. 2700 S., Magna, UT 84044; (801) 250-8303



W.O.R. Raceway, 3150 Brinker Ave., Ogden, UT 84401



VERMONT

Mike's Hobbies & Raceway, 162 N. Main St., Rutland, VT 05701; (802) 775-0059

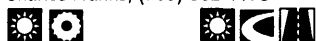


Silver Towers Raceway, Elks Club, North Ave., Burlington, VT 05401; (802) 658-4490



VIRGINIA

A-1 Raceways, 940 Radford Rd., Christiansburg, VA 24703; Kay or Charles Franks, (703) 382-1173



Bob's Hobbies & Raceway, 910-J Brandy Creek Dr., Mechanicsville, VA 23111; Bob Wagner, (804) 746-2758



Cooper's R/C Raceway, Rt. 4, Box 12203, Chatham, VA 24531; (804) 724-4182



Mid Atlantic Raceway, 89 E. Elizabeth St., Harrisburg, VA 22801; (703) 433-3952



The Race Place, 3180 King William Ave., Westpoint, VA 23181; (804) 843-4933



Winners Circle, 3236 W. Clay St., Richmond, VA 23230; (804) 355-7076



WASHINGTON

Alfie's, 108 South K St., Aberdeen, WA 98520; (206) 533-6638



Arlington Heights Speedway, 13629 228th St. NE, Arlington, WA 98223; Shawn Bussert, (206) 435-3442



Four Seasons R/C Racing, 146 School St. SE, Olympia, WA 98506; (206) 491-2430



Hank Perry Race Complex, Sullivan Rd., WA 99213; (509) 927-1879



Tacoma R/C Raceway Hobbies, 6305 6th Ave., Tacoma, WA 98406; (206) 565-1935



WEST VIRGINIA

R/C Race Place, Rt. 10, Box 351, Morgantown, WV 26505; (304) 292-0811



WISCONSIN

Fox Valley Off-Road Racing Club, R1, Mayflower Rd., Hortonville, WI 54944; (414) 739-9211



Frog's R/C Raceway, Rt. 1, Phillips, WI 54555; (715) 339-2314 or 339-2958



Hobbytown Speedway, 4231 8th St. S., Wisconsin Rapids, WI 54494; (715) 421-1222



Hobby World Speedway, 3198 London Rd., Eau Claire, WI 54701; (715) 834-0456



JJ's Dirt Heaven, 6028 County K, Champion, WI 54229; (414) 866-9096



Maniac Motors Raceway, 244 Rt. 1 A1 Rt. H, Kendall, WI 54638; (608) 847-4833



Midwest Tri-Clone, 144 N. Main St., West Bend, WI 53095; (414) 334-0487



The Pits Hobby Shop, 786 Morris Ave., Green Bay, WI 54304; (414) 494-4200



R/C Spectacular, Milwaukee Mecca Auditorium, c/o Wisconsin Motorsports Show, 11020 W. Rogers, Milwaukee, WI 53227; (414) 327-3999



Stoltz Raceways, 548 Summit Dr., West Bend, WI 53095; (414) 338-6097



West Bend Hobbies, 144 N. Main St., West Bend, WI 53040; (414) 334-0487



CANADA

Aprilia Track, 20 Parsons Ridge, Kanata, Ontario, Canada K2L 2N4; (613) 836-2577



Autodrome des Prairie, 935 Boul. St-Luc, St-Luc, Quebec Canada J0J 2A0; (514) 348-0718



Autodrome Sher-Hobby, 1035 Panneton, Sherbrooke, Quebec Canada; (819) 820-1151



Cantraxx Raceway, 8876-48 Avenue SE, Edmonton, Alberta Canada T6E 5L1; (403) 469-9193



Circuit R/C Bonzai, 164 Cowie, Granby, Quebec, Canada J2G 3V3; (514) 372-3622



Circuit St-Denis Auto Teleguide, 292 DuLion, St-Denis, Quebec, Canada JOH 1K0; Francois Rivard, (514) 787-1127



Crash Course, Box 9, Site 8, RR #1, Spruce Grove, Alberta Canada T7X 2T4; Tim Starrevelid (403) 963-5795



CRCD, 4565 Bh St-Joseph, Drummondville, Quebec Canada J2A 1B4; Jacques Lefebvre, (819) 474-4001



GRSCR, 9 Gauthier, St-de L'Achigan, Quebec Canada J0K 3H0; (514) 588-4254



Hobby Center, SQS.210 Bl.H, Apt. 204, Brasilia, DF-Brasil 70.273; 061-242-0488



Honda House Motor Speedway, 384 Richmond St., Chatham, Ontario Canada N7M 1P9; (519) 354-5530



J-T International Raceway, 127 Milligan Lane, Napanee, Ontario Canada K7R 8A1; (613) 354-0099



Quintrax Speedway, Box 1034, Belleville, Ontario Canada K8N 5B6; (613) 962-1414; Fax: (613) 962-7306



Rouillon Hobby Track, 177-D St-Jean Baptiste, Chateauquay, Quebec Canada J6K 3B4; (514) 698-2151



Universal R/C Speedway, Niagara St., Welland, Ontario Canada; (416) 735-5051



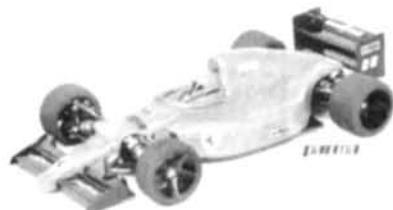
WHAT'S NEW



MRC/TAMIYA Toyota Celica GT-Four

Do you want an R/C car that looks good and runs well on on-road and off-road courses? Then try Tamiya's 1/10-scale Toyota Celica GT-Four Rally car. It has shaft-driven 4WD, an aerodynamic polycarbonate Toyota Celica body, a modified bathtub-type chassis and a three-piece steering system. It also has four-wheel independent suspension, oil-filled dampers and scale-looking rally-type wheels.

For more information, contact MRC, 200 Carter Dr., Edison, NJ 08817.



PARMA INTERNATIONAL 1/10-Scale F1 Ferrari

Parma's new F1 Ferrari body is hot! It comes with a bi-level rear wing and wing tape, and its sturdy side dams and winglets are die-cut separately to increase stability and realism. The result is a striking reproduction of the full-size car.

Part no. 10346

Price: \$21

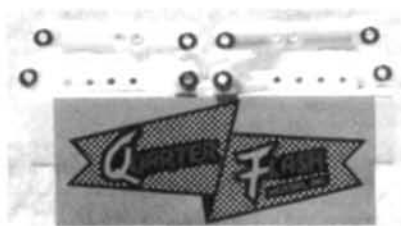
For more information, contact Parma International, 13927-PR Progress Pky., N. Royalton, OH 44133.



PSE Magnum Motors

PSE's line of Magnum Modified hand-wound motors offers a large selection of balanced, precisely wound motors. PSE's Magnum Stocks come with race-proven cut brushes and proper spring-tension settings, and they're completely broken-in. Choose from the ROAR-legal motors with 24 degrees of timing or the Pro-Stock High-Timing motors.

For more information, contact PSE, 210 N. Goldenrod Rd., Unit 10, Orlando, FL 32807.



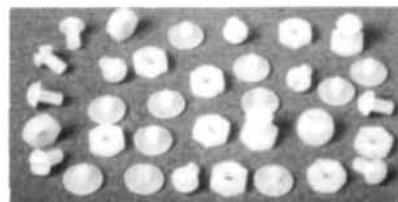
QUARTER FLASH MOTORS Ultra RC10 Arms

Quarter Flash's new Ultra RC10 A-arms ride the wave of the future. To give your car a smooth, consistent "feel," each arm has four bearings that ride totally on the hinge pins, so the arms move freely. (They must be used with standard, not titanium, hinge pins.)

Part no. 419

Price: \$69.95

For more information, contact Quarter Flash Motors Inc., 1143 N. Winstel, Tucson, AZ 85716.



BUD'S RACING PRODUCTS Screw and Rivet Set

These lightweight nylon screws and rivets are perfect for reinforcing wings, adding side dams to dirt-oval bodies or adding spoilers to on-road and off-road cars—anything you can dream up!

Part no. 7570

Price: \$2.95

For more information, contact Bud's Racing Products, 1575 Lowell St., Elyria, OH 44035.



TRINITY PRODUCTS Ampasaurus 2

The Ampasaurus 2 is a 7-cell stick pack with premium-grade Sanyo 1700mAh SCE cells that have double-welded tabs to reduce resistance. The pack fits easily into most cars, and it has Trinity purple endcaps through which the wires can exit at either the top or the side. It uses pure-copper 14AWG silicon wire, and it comes with a Tamiya-style connector.

Part no. 5759

Price: \$54.99

For more information, contact Trinity Products Inc., 1901 E. Linden Ave., #8, Linden, NJ 07036.



TRINITY PRODUCTS Speedworks Sport Pak

This inexpensive entry-level battery pack is made of Sanyo KR1500SC cells, and it replaces Trinity's discontinued no. 0011 sport pack. It comes with a Tamiya-style connector.

Part no. 0010

Price: \$24.99

For more information, contact Trinity Products Inc., 1901 E. Linden Ave., #8, Linden, NJ 07036.

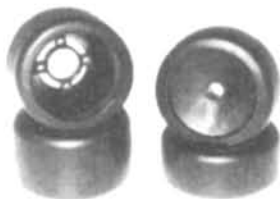


TRAXXAS Hard-Coat Shocks

Better than hard-anodized shocks, Traxxas Hard-Coat shocks greatly reduce piston/housing friction, and this helps to prevent the heat build-up that can cause inconsistent performance. The coating actually permeates the T-6 aluminum, making it many times more resistant to wear and corrosion.

Part nos. 4760 (long shocks); 4761 (extra-long shocks).

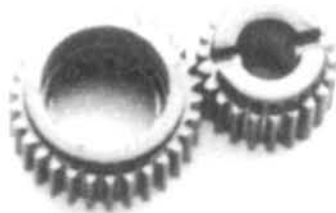
For more information, contact Traxxas Corp., 12150 Shiloh Rd., Dallas, TX 75228.



PSE Rubber-Capped Tires

PSE's rubber-capped tires are designed for high-speed, on-road, oval racing. Light and durable, they come individually packaged and are compatible with PSE's race-winning advanced composite wheels. They come on black wheels and are available with a standard outside diameter (Std.) or a 1/8-inch stagger (Stg.) in the following compounds: red (soft), gold (medium), or silver (firm).

For more information, contact PSE, 210 N. Goldenrod Rd., Unit 10, Orlando, FL 32807.



TRAXXAS High-Speed Black Gears

Traxxas introduces its new "Black" high-speed top gears, idler gears and diff gears for the Pro Series truck transmission. Molded of a new material that reduces friction and rotating mass, the gears increase speed and acceleration, and they're more durable, even under severe loads and adverse conditions.

Part nos. 1995 (top gear); 1996 (idler gear); 4660 (diff gear).

For more information, contact Traxxas Corp., 12150 Shiloh Rd., Dallas, TX 75228.



DAHM'S RACING BODIES '91 Pontiac Grand Prix

Dahm's exciting new super-aerodynamic Pontiac NASCAR racing body and the Thunderbody underbody fit narrow 1/10-scale on-road race cars. The lightweight .030-thick Lexan Pontiac body has realistic details, and it comes with a bolt-on adjustable rear spoiler. You mount the Thunderbody on the bottom of the frame with two-sided tape and then attach it to the Pontiac body with Velcro®. The Thunderbody increases your car's top speed, improves its handling and protects its body and frame. The body and underbody are available separately or together.

Part nos. D102 ('91 Pontiac Grand Prix NASCAR body); D128 ('91 Pontiac Grand Prix NASCAR Thunderbody); D102C (combination).

Prices: \$19.98; \$16.98; \$35.98.

For more information, contact Dahm's Racing Bodies, P.O. Box 360, Cotati, CA 94931.

Descriptions of new products appearing on these pages were derived from press releases supplied by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Radio Control Car Action**, nor guarantee product performance or safety. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Radio Control Car Action**.

Radio Control CAR ACTION CATALOGUE COLLECTION

1 9 9 2

HERE IT is again!—Car Action's second annual catalogue collection. Now you can curl up with your favorite reading material (next to Car Action, of course!) and make your purchasing decisions in the privacy of your own home, or pit, or track...you get the picture.

We provide all the information on how you can get your grubby little hands on these fine catalogues; the rest is up to you.



A&L

A&L offers suspension and steering parts for all major cars on the market. For a complete catalogue, send \$2 to Allec & Lane Mfg., P.O. Box 2115, Corona, CA 91718.

ACE Hardware Hobbies

Specializing In
1/8 Scale Gas



1863 El Camino Real
Burlingame, CA 94010
415 / 697-6099

ACE HARDWARE HOBBIES

Specializing in 1/8-scale gas, Ace carries kits and parts for all major cars on the market. Write to Ace Hardware Hobbies, 1863 El Camino Real, Burlingame, CA 94010. Phone (415) 697-6099; fax (415) 697-6801.



AEROTREND

Aerotrend's products include Blue Line fuel tubing, ball bearings and battery packs. For a free catalogue, write to Aerotrend Products, 31 Nichols St., Ansonia, CT 06401-1106. Phone (203) 734-0600; fax (203) 732-5668.



ASSOCIATED ELECTRICS

Team Associated has five free catalogues—one for each of its cars. Write to Associated Electrics, 3585 Cadillac Ave., Costa Mesa, CA 92626, and specify one of the following: RC10, RC10T, RC10L, RC12LW, or RC500.



ASTRO FLIGHT

Team Astro manufactures chargers, speed controllers and connectors. For their free catalogue, write to Astro Flight, Inc., 13311 Beach Ave., Marina Del Rey, CA 90292. Phone (213) 821-6242; fax (213) 822-6637.



AUTOGRAPHICS

Autographics has your decal needs covered. To get the latest on all their new products, write to Autographics of California, 7401-1 White Ln., Bakersfield, CA 93309. Phone (805) 836-2886; fax (805) 836-0938.

POWERED BY
B&T Racing Team

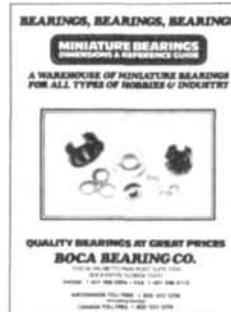
B&T RACING TEAM

B&T offers battery packs, motors, tires and wheels, wire, braid, shrink-wrap and brushes. For a free catalogue, write to B&T Racing, 508 Lake Winds Trail, Rougemont, NC 27572. Phone (919) 471-2060.



BINKS

Binks' airbrushes and airbrushing accessories include the Raven and Wren airbrushes and the unique Chameleon color changer. Write to Binks, 9201 W. Belmont Ave., Franklin Park, IL 60131.



BOCA BEARING CO.

Boca Bearing sells individual bearings and prepackaged bearing kits. For three informative catalogues, send \$3 to Boca Bearing Co., 7040 W. Palmetto Park Rd., Ste. 2304, Boca Raton, FL 33433.



BOLD CREATIONS

Bold Creations products include connectors, battery dumpers and nylon pinion gears. To receive their catalogue, send \$1 to Bold Creations, P.O. Box 1828, Round Rock, TX 78680.



BOLINK

With its successful line of car kits, bodies, tires and gears, Bolink has established itself as one of the leaders in the on-road industry. For a catalogue, send \$3 to Bolink R/C Cars, 420 Hosea Rd., Lawrenceville, GA 30245.

BUD'S
RACING PRODUCTS

BUD'S RACING PRODUCTS

Bud's offers products for the on- or off-road enthusiast—from motors to wings, wire, bodies and diff parts. For a brochure, send \$2 and a business-size SASE to Bud's Racing Products, 1575 Lowell St., Elyria, OH 44035.



B&R MOTOR WORKS

For the fastest modified and stock motors, check out B&R. Their legendary Bullet stock motor is great for stock racing, and their modifieds are national champions! Send a business-size SASE to B&R Mfg. Inc., 28000 Tothill Dr., Santa Clarita, CA 91350.



C&M MFG.

Manufacturers of the successful line of Cobra race cars, C&M also offers motors, battery dischargers, tire truers and other racer-oriented equipment. For a brochure and a set of decals, send \$2 to C&M Mfg., P.O. Box 701-353, West Valley City, UT 84170.



INNOVATIVE & FUNCTIONAL
R/C EQUIPMENT

CHEETAH RACING

Cheetah Racing manufactures on-road, high-speed equipment—everything from swivel body posts to quick-change battery systems. To receive their catalogue, send \$2 and a 4x9-inch SASE to Cheetah Racing, 10823 Amestoy Ave., Granada Hills, CA 91344.



COMPETITION ELECTRONICS

Competition Electronics produces some of the highest grade battery-matching and -charging equipment available. For a free catalogue, write to Competition Electronics Inc., 3469 Precision Dr., Rockford, IL 61109. Phone (815) 874-8001; fax (815) 874-8181.



COVERITE

The Bodyshop line of R/C body accessories offers the perfect way to finish a Lexan body. Coverite has special paints (just for Lexan), masking tape, pinstriping tape and trip sheets to make your body into a concours winner! Send an SASE to Coverite, 420 Babylon Rd., Horsham, PA 19044. Phone (215) 672-6720.



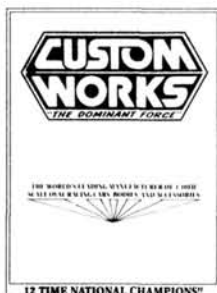
COX HOBBIES

For fans of fuel-powered racing, Cox is the place! With their new .049-sized 1/12-scale race cars, Cox has ushered in a new era in R/C racing! For a free catalogue, write to Cox Hobbies, 350 West Rincon St., Corona, CA 91720. Phone (714) 278-1282; fax (714) 278-2981.



CRP

When you hop-up your car, check out CRP! They manufacture parts for almost every popular car on the market. To receive their catalogue, send \$3 to Custom Racing Products, 8784 Plata Lane, Atascadero, CA 93422.



CUSTOM WORKS

Custom Works manufactures the most successful dirt-oval cars! After winning sixteen national championships, they bring their extensive racing knowledge to you. For a free catalogue, write to Custom Works, 3720 Easton Dr., #6, Bakersfield, CA 93309. Phone (805) 323-0471; fax (805) 323-0473.



DAHM'S

Dahm's makes bodies in many varieties (for on-road or off-road cars or trucks), as well as wings, graphics, Instant-Tint, Pro Mask and many other products. For a catalogue with a fold-out poster of their racing bodies, send \$2 to Dahm's Racing Bodies, P.O. Box 360, Cotati, CA 94931.



DAN'S RC STUFF

Dan's RC Stuff makes all those things that you never think of, but end up wanting—everything from their much-copied battery bars to their Banana Lube. For a catalogue and a set of racer decals, send \$3 to Dan's RC Stuff, 9525c Cozycroft Ave., Chatsworth, CA 91311.



DU-BRO

Du-Bro is the leader in ball ends, tie rods, and hardware. To receive their catalogue, send \$1 to Du-Bro Products, Inc., Attn: Car Catalogue, P.O. Box 815, Wauconda, IL 60084.



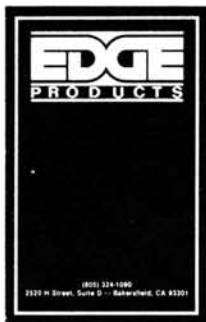
DURATRAX

DuraTrax manufactures one of the largest selections of off- and on-road tires on the market today! Other products include graphite chassis, motor spray and speed controllers. Write to Hobbico, P.O. Box 4021, Champaign, IL 61824-9021.



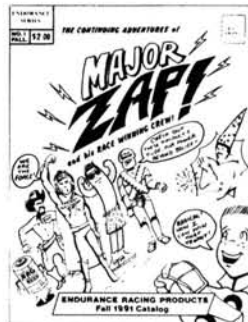
EAGLE PRODUCTS

Eagle introduces several new styles of pressure-sensitive graphics for R/C cars and trucks. Eagle produces custom decals and banners for clubs and R/C racing teams. For a catalogue and price list, send \$2 to Eagle Products, P.O. Box 4609, Covina, CA 91723.



EDGE PRODUCTS

Edge Products makes the little things that make your car go faster! For a brochure on commutator cleaners and pre-seated motor brushes, write to Edge Products, 2520 H Street, Ste. D, Bakersfield, CA 93301.



ENDURANCE RACING PRODUCTS

ERP manufactures motor zappers, motors, brushes, lubes, batteries, motor coolers and many other products. For a catalogue, send \$2 to Endurance Racing Products, 826 N. Lamb, Las Vegas, NV 89110.



FIVE STAR

If you're looking for chargers, batteries, tools, or lubricants, check out Five Star. For a catalogue and free decal sheet, send \$2 to Five Star Racing Line, 3640 Milwaukee St., Port Huron, MI 48060.



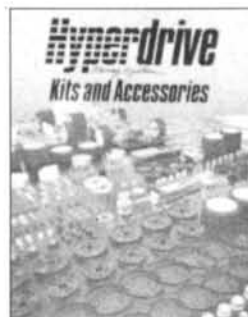
HOBBI DYNAMICS

Hobby Dynamics distributes many products, including the JR line of radios, Hirobo cars and helicopters. For a free catalogue, write to Hobby Dynamics, P.O. Box 3726, Champaign, IL 61826-3726. Phone JRSA at (217) 355-9511.



HPI

HPI's broad range of products includes wheels and tires, motors, suspension parts and hardware. For a complete catalogue, send \$2 to Hobby Products International, 22600-C Lambert, Suite 904, El Toro, CA 92630.



HYPERDRIVE

Hyperdrive offers belt-drive conversions, tires, pinions and their unique H10 SC and H10 SE cars. For a free catalogue, write Hyperdrive Racing Systems, 3210 Howard Nickell Rd., Fayetteville, AR 72703. Phone (501) 444-8200; fax (501) 444-8402.



IMPACT RACING PRODUCTS

Impact offers high-spec support parts and equipment for 1/10-, 1/12-, 1/8- and 1/4-scale race cars. Their experience comes from full-scale racing. Send \$2 to Impact Racing Products, 2501 West 137th St., Leawood, KS 66224.



JPS

JPS manufactures some of the most beautiful custom aluminum wheels on the market today. Their designs fit most popular cars. For a catalogue and a set of decals, send \$2 to JPS Custom Wheels, P.O. Box 3014, Fullerton, CA 92634.



KYOSHO

Kyosho's huge variety of products—cars, trucks, helicopters, planes, boats, motorcycles and hundreds of accessories—is in one catalogue. Send \$7 for catalogue KYOZ 0180 to Great Planes Model Distributors, P.O. Box 778, Champaign, IL 61824-0778.



KYOSHO MINI CATALOGUE

This 12-page catalogue includes many color photos and brief, informative descriptions that cover Kyosho's most popular models. For catalogue KYOZ 2010, write to Great Planes Model Distributors, P.O. Box 778, Champaign, IL 61824-0778.



LIGHTNING PRODUCTS

Tired of your car falling over when you're working on it in the pits? You'll appreciate the quality and ingenuity that have been designed into Lightning Products' car stands. Write to SMC/Lightning Products, 12519 Wanda Ln., Magnolia, TX 77355. Phone (800) 527-1079.



LITESPEED

Litespeed's products include a large selection of motor-mount heat sinks and super-cons connectors. To receive their catalogue, send two postage stamps to Litespeed Catalogue, P.O. Box 4765, Spokane, WA 99202.



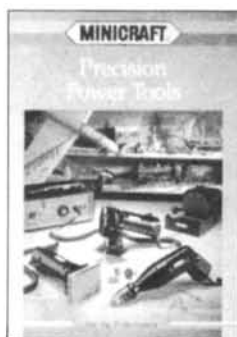
LOCTITE

Known for their famous 242 Threadlocker, Loctite's products include glues, silicone gasket makers, cleaners and hand cleansers! Write to Loctite Corp., 4450 Cranwood Court, Cleveland, OH 44128.



McALLISTER RACING

McAllister offers almost every body style imaginable, along with the decals and interiors to match! For a complete catalogue, send \$2 to McAllister Racing, 2245 First St. #105, Simi Valley, CA 93065.



MINICRAFT

Minicraft's large assortment of precision power tools includes drills, saws and sanders. For a free catalogue, write to Minicraft, 1 Perfection Ln., Ridgely, MD 21685. Phone (800) 288-5331.

MIP

MIP

MIP manufactures after-market gearboxes and suspension and shock accessories for the RC10 and the JR-X2. For their catalogue, send \$2 to Moore's Ideal Products, 746 E. Edna Place, Covina, CA 91723.



NOVAK ELECTRONICS

Novak is on the cutting edge with the newest high-frequency speed controllers and receivers. For a free catalogue, write to Novak Electronics, Inc., 128-C East Dyer Rd., Santa Ana, CA 92707. Phone (714) 549-3741; fax 714-549-2740.



PAASCHE

Paasche has been manufacturing its fine line of airbrushes and airbrush accessories since 1904. For a free catalogue, write to Paasche Airbrush Co., 7440 West Lawrence Ave., Harwood Heights, IL 60656-3497. Phone (708) 867-9191, fax (708) 867-9198.



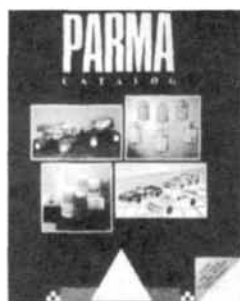
PACIFIC TRADING

Pacific Trading imports products from companies such as Rossi and Shinwa. To receive their catalogue, send \$5 to Pacific Trading Company, P.O. Box 3593, Mission Viejo, CA 92690-1593.



PARAGON

Paragon makes parts that keep the winners winning—from gears and tires to the most innovative accessories and the slickest lubes. For a catalogue and a set of decals, send \$2 to Paragon Racing Products, 690 Industrial Circle South, Shakopee, MN 55379.



PARMA INTERNATIONAL

Parma designs and builds R/C products that include bodies, motors, decals, cars and accessories. For a catalogue, a price list, stickers and a free poster of Parma bodies, send \$4 to Parma International Inc., 13927 Progress Pkwy., North Royalton, OH 44133. Phone (216) 237-8650; fax (216) 237-6333.



PRO-LINE

Pro-Line makes tires that win races—plain and simple. From RED racing treads to street tires, Pro-Line has you covered on all four corners. For a catalogue, send \$2 to Pro-Line, P.O. Box 456, Beaumont, CA 92223.



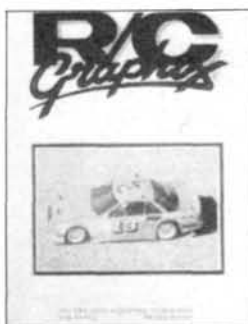
PTI

PTI offers an extensive range of cells to meet your racing or hobby needs. For your free 8-page color catalogue that covers the whole spectrum of PTI's product line, write to Progressive Technologies Inc., Hobby Division, P.O. Box 4648, Winston-Salem, NC 27115-4648 (attn: Randy Smith).

DIO CONTROLLED
Ram MODELS INC.

RAM

RAM manufactures many electronic R/C devices, e.g., lights, sound systems and fail-safes devices. To receive their catalogue, send a SASE to RAM Inc., 4736 N. Milwaukee Ave., Chicago, IL 60630.



R/C GRAPHIX

Tired of hand-cutting those little letters so that you can put your name on your car? Let R/C Graphix create decals for you! For a catalogue explaining their expanded services and product line, send \$2 to R/C Graphix, 4079 Tara Ct., Loganville, GA 30249.



REEDY MODIFIEDS

Reedy Modifieds has won more world championships than any other motor manufacturer! For more information, write to Reedy Modifieds, 3585 Cadillac Ave., Costa Mesa, CA 92626.



RPM

RPM manufactures many parts to fit the most popular R/C cars on the market, e.g., suspension arms and blocks, hub carriers, shock accessories and much more! For a catalogue and decals, send \$2 to RPM, 14978 Sierra Bonita Ln., Chino, CA 91710.



SCI

Need a new electronic speed controller? From inexpensive reversing models to super high-power card models, SCI has a model to suit all your needs. For product information, write to SCI Power Corp., P.O. Box 13099, Airgate Station, Sarasota, FL 34278.



SERMOS

Sermos R/C snap connectors are some of the most efficient on the market! For more info, write to Sermos, Cedar Corners Station, Box 16787, Stamford, CT 06905.



SHERLINE

Sherline Products manufactures high-quality tools and accessories. For a 20-page, full-color catalogue about their compact, portable lathes and mills, send \$2 to Sherline Products, Inc., 170 Navajo St., San Marcos, CA 92069.



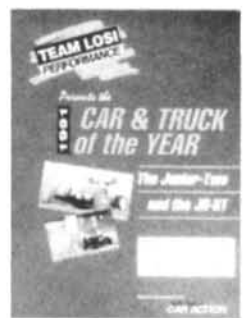
STAGE III

When you think of batteries, think of Stage III. Stage III offers cell testing and recharging, battery braid, their famous Super 13 wire and clear cell-shrink. For free product information, write to Stage III, 1189 Chicago Rd., Troy, MI, 48063. Phone (313) 585-1150; fax (313) 978-9085.



TAMIYA

Tamiya's "Radio Control Guide Book" contains a full catalogue of its R/C vehicles and accessories, and a section on building and finishing R/C cars. It even shows you how to build your own track, and it has tips on running races. The price is \$6, and it's available at hobby shops.



TEAM LOSI

Producers of the JRX-Pro and the Junior T, Team Losi also offers tires, motors, cars, gears and much more! For a catalogue and stickers, send \$1 to Team Losi, Inc., 1655 E. Mission Blvd., Pomona, CA 91766. Phone (714) 465-9400; fax (714) 590-1496.



TEAM PIT STOP

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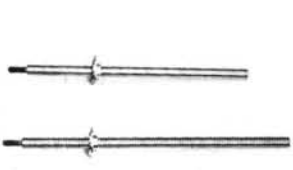


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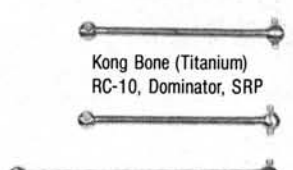
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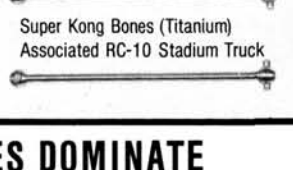
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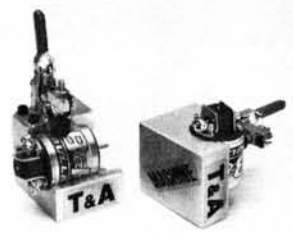
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